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AN EXPERIMENTAL STUDY OF MUSICAL ENJOYMENT ¹

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I. INTRODUCTION

The investigation which is here reported aims to make a contribution to the psychology of the appreciation and enjoyment of music. A variety of musical compositions were employed; plethysmographic and pneumographic records were made throughout. The chief aim, however, was to obtain a detailed and accurate description of the mental processes

¹From the Psychological Laboratory of Clark University.

which were present, and to correlate these findings with the type of observer on the one hand, and with the type of musical composition on the other. It has been our hope to throw light upon the following problems: How does music produce its effects? What are the bodily correlates of musical enjoyment? What are the limits within which pure music may be used as a means of expression? What are the differences in the mental processes involved in the various sources of musical enjoyment?

II. HISTORY OF THE PROBLEM²

The psychology of musical enjoyment is intimately related to the problems of aesthetics; and it is impossible to review the literature of the former without taking the literature of the latter into account. With the problems of speculative aesthetics we are not immediately concerned. We shall therefore confine our attention, so far as possible, to those studies which have a direct bearing upon the specific topic of our investigation; and we shall venture into the field of the aesthetician only in so far as such a course seems to be demanded in the interests of a clear and systematic presentation of the findings of previous investigators of our problem.

Several writers have raised the question: To what extent is musical composition adequate as a vehicle of expression? Gilman (130), the pioneer investigator of this topic, employed a method which consisted in playing a program of thirteen carefully chosen selections (piano and violin) before an audience of thirty non-professional musicians; and the auditors were asked to answer certain definite questions regarding the effect of the music upon them. Downey's (128) method was similar to Gilman's save for the fact that she employed fewer musical compositions, in order to avoid fatigue, and she asked no definite questions, in order to eliminate the influence of suggestion. The results of both these investigators were negative in so far as concerns the ability of the composer to communicate scenes, incidents, or ideas (non-musical) to all of his auditors in common; but they indicate that music may arouse the same mood in the minds of several auditors. The investigation was continued by Ferrari (129) and Lahy (13) who refined the method but obtained essentially the same result.

Another question which has been attacked by investigators is this: What is the nature of the bodily reactions,—changes in the rate of heart-beat and in the distribution of blood supply, changes in the function of respiratory and other muscles,—which result from auditory stimulation? The pioneer investigations of Dogiel concerning volu-

² As originally prepared, this paper included a detailed description of the several contributions which have been made to the solution of various problems which are directly or indirectly concerned with the topic of our investigation. But the necessity for condensation has resulted in the sacrificing of certain sections, and the curtailing and recasting of others. In several instances, we shall be able to do no more than refer the reader to the papers which are listed in our classified bibliography. We hope to return to the discussion of various points which have been raised by previous investigators.

metric changes possess no more than historical value. Féré (94) reports that isolated notes and 'scales' have a dynamogenetic effect whose magnitude varies with their pitch and intensity. This result was confirmed by Tarchanoff (119) who also found that 'gay music or music of rapid tempo' neutralizes the effects of muscular fatigue; and Scripture (118), employing *motifs*, instead of isolated tones and simple sequences of tones, reports that he has confirmed the finding of Féré. In an investigation of the knee-jerk, Lombard (116) found that the amplitude of this reflex is increased in the presence of musical compositions,—and increased in different degree by compositions of different character. In a subject, part of whose skull-wall had been removed, Patrizi (117) was able to observe that tuning-fork stimuli and musical compositions increased the volume of the brain; but he failed to find that volumetric differences are correlated with differences in the character (gay or sad) of musical compositions. In an investigation of the effect of musical compositions upon pulse and respiration, Mentz (104) found that a retardation of pulse occurs with perfect consonances, with significant changes of tonal intensity, with the approach of the *finale*, and with the emotion of pleasantness; the heart-rate increases when the auditor concentrates his attention upon the composition and attempts to analyze it. Binet and Courtier (111) employed consonant and dissonant chords, major and minor intervals, etc., together with fragments of musical compositions, in an investigation of this same problem. They found that all of their auditory stimuli produced an acceleration of heart and of respiration; this acceleration was greater in the case of dissonant chords, major chords, and chords in rapid succession; the effects of musical composition are more intensive than are the effects of isolated chords. Gibaud's results (115) show an utter absence of uniform correlation between consonance and volumetric change,—a negative finding which this investigator refers to individual differences among his observers. Ferrari (113) made plethysmographic records of the effects of music upon normal and pathological auditors. Only in his idiotic and insane subjects did he find any vaso-motor change which could be correlated with musical emotion. The author refers these changes to an assumed absence of cortical control; and he employs his results as an argument against Lange's envisagement of the emotive process. Foster and Gamble (114) found that the effect of music upon respiration is similar to the effect of mental application in general, in so far as rate and amplitude of breathing are concerned; but they report that the regularity of respiration, which is characteristic of mental work, is lacking in the presence of music. In an investigation of the relation between 'Organic Change and Feeling,' Shepard (106) included a few experiments in which the effects of music were recorded by means of a plethysmograph. Agreeable and exciting music was invariably attended by a more rapid pulse, agreeably depressing music by a shorter pulse.

III. EXPERIMENTAL

1. *Preliminary Experiments.*—Our investigation includes a few preliminary experiments which were undertaken with a view to obtaining a general survey of the field, and a group of more accurately planned experiments which occupied our attention during the years 1910-11.

In the preliminary experiments, we had eight observers; five compositions were repeated at intervals with each observer, and the observers were asked, in the most general terms, to describe their experiences

under the influence of the music. These selections were played upon a pianola-piano; and in later experiments, a Swiss music box was employed. One hundred and forty introspective descriptions were obtained from these two preliminary groups of experiments; and these were supplemented by forty pneumographic and plethysmographic tracings. This preliminary survey of the field also included a printed list of questions which was sent to fifty of the most noted composers, critics, and teachers of America. It was hoped, by this means, to obtain information regarding the musical experiences of a great number and a great variety of auditors; but this mode of attack upon the problem proved to be barren of result, and none of the data which were obtained in this preliminary survey will be incorporated in the present paper, excepting in two instances where they will be referred to in passing.

The data upon which this paper is based were obtained in an experimental investigation of the problem which was undertaken in the psychological laboratory of Clark University. Our method of investigation consisted essentially in playing a variety of compositions in the presence of an auditor, and in obtaining plethysmographic and pneumographic records of such bodily changes in circulation and respiration as may have occurred before, during, and immediately after the rendering of the composition; and, in obtaining detailed introspective descriptions of such mental processes as were present.

2. *Apparatus.*—The apparatus consisted of a Lehmann plethysmograph and two Sumner pneumographs; one of the pneumographs recorded the thoracic, and the other the abdominal movements of respiration. The tracings were recorded by means of Marey tambours upon the smoked drum of a Zimmermann kymograph; the kymograph was so adjusted that the drum made one complete revolution in five minutes. A time line, marking seconds, was recorded upon the drum by means of a fourth tambour which was actuated by a metronome; the metronome stood in an adjoining room, and every care was taken to make our apparatus as nearly noiseless as possible. The music was furnished by a Victor Talking Machine (Model V.). This machine was equipped with a wooden horn; and fibre needles were employed throughout. In order still further to reduce the slight grinding noise, the Victor Machine was inclosed in a box, from which only the bell-shaped end of the horn projected.

The phonographic records were carefully chosen to avoid imperfections and to secure the best possible timbres. These compositions represented contrasts in tempo and rhythm, in form and style; and they included reproductions of the violin, cello, xylophone, string quartette, orchestra, concert band, and

military band. A list of these selections, with the metronome rates at which their various sections were played is appended :

Cradle Song, *Hauser*, Cello (60-63) ; Rondo from Serenade, Op. 525, *Mozart*, String Quartette (116) ; Diplomat March, *Sousa*, Concert Band (116) ; Angel's Serenade, *Braga*, Violin and Cello (126) ; Fifth Nocturne, *Leybach*, Violin Solo (50) ; New Tipperary March, *Fulton-Helf*, Military Band (120) ; Serenade, *Pierne*, Instrumental Quartette (88-92) ; Merry Widow Burlesque, Orchestra (160-132) ; Norma Selection, *Bellini*, Military Band (126-168-42-168) ; Mignon-Gavotte, *Thomas*, String Quartette (92-96) ; Songe d'Automne, Orchestra (62) ; Berceuse, *Godard*, Violin (42-52) ; Melody in F, *Rubenstein*, Violin (76-72) ; A Hunt in the Black Forest, *Voelker*, Orchestra (60-176-116-176) ; Minuet, *Paderewski*, Orchestra (120) ; Pearl Fishers Selection, *Bizet*, Concert Band (88-84-72) ; The Spinning Wheel, *Spindler*, Concert Band (13) ; Prize Song from Meistersinger, *Wagner*, Cello (69-66-63) ; Ernani Selection, *Verdi*, Concert Band (104-172-46-76) ; Leonore Overture No. 3, *Beethoven*, Concert Band (138-144-164) ; Badinage, *Victor Herbert*, Cello and Orchestra (116) ; Carnival of Venice, *Benedict*, Xylophone Solo (69) ; Humorous Variations on a German Folk Song, *Wollweber*, Concert Band (92-164-66-60-88) ; Hungarian Fantasia, *Tobani*, Orchestra (69-154-63-152) ; Carmen Selection, *Bizet*, Military Band (152-116) ; Spanish Waltz, *Nathan*, Concert Band (104).

3. *Method*.—Our method aimed to institute a detailed comparison between an auditor's normal respiration, heart-beat, and distribution of blood-supply, and the same auditor's respiration, heart-beat, and distribution of blood-supply while listening to music. The experiments were carried on in a quiet room on the third floor of the main building of the University. At the beginning of each experiment the auditor took his seat in a Morris chair with his back to the light ; his right arm was adjusted in the plethysmograph ; and the pneumographs were fitted to his body. Every precaution was taken throughout to eliminate any discomfort or distraction which might arise from the presence of the apparatus.

The reader need scarcely be reminded that a failure to observe these precautions would have vitiated the investigation ; and he may be assured that, notwithstanding the fact that a complicated apparatus was employed, the auditors testified that their attitude and reaction were, after a few preliminary sittings, identical with their attitude and reaction to the rendering of a musical program under ordinary conditions. Indeed, the writer was surprised to discover that the auditors were wholly oblivious to the presence of the apparatus, save in two instances which will be discussed later. Not only did they report that they gave themselves up to the enjoyment of the music, but they also reported that they even were oblivious in most instances of the fact that the music was a phonographic reproduction,—they actually seemed to be in the presence of a quartet and orchestra, and they seemed to see the violinist, the conductor, and the various musical instruments.

When the plethysmograph and the pneumographs had been adjusted and had been connected with the tambours, a 'ready'

signal was given and the auditor composed himself as passively as possible. After a brief pause which was introduced in order to allow the auditor to recover from the distraction of the signal, the kymograph was set in motion and a preliminary record of the normal heart action and respiration was obtained. When the kymographic tracings indicated that passivity had been present for thirty or forty seconds, the music began.

The observer had been instructed to listen to the music in whatever way he pleased, but preferably in the way in which he usually enjoyed music. He had been told that when the music ceased, he would be asked to give a description of his experiences. The reader may suspect, as indeed the writer did suspect, that these instructions may have influenced the observer's attitude and reaction to the music. For this reason, control experiments were introduced in which the observer was assured that he would not subsequently be asked to give an account of his experiences. Every observer, without exception, reported that his attitude and his enjoyment were, so far as he was able to discover, identical in the two cases. Vocal music was not employed in our experiments; the name of the composer and the title of the composition were at all times withheld from the auditor, and no verbal or other extrinsic suggestion was given as to the nature or character of the selection.

Each composition required from three and one-half to four and one-half minutes. When the drum of the kymograph had completed its revolution, it was stopped and the observer began immediately to dictate his introspection. If, when he had finished his recital, any manifest variations in his kymographic tracings still remained unaccounted for, the experimenter attempted, by means of carefully worded questions, to lead him to supplement his description. A record was kept, not only of his answers, but of the exact wording in which the questions had been formulated.

4. *Observers.*—The observers in this experiment were all students in the Psychological department of this University. They were Misses S. C. Fisher (Fs.), B. E. Roethlein (R.), M. Van Waters (V.), E. L. Woods (W.), Messrs. E. S. Conklin (C.), E. O. Finkenbinder (Fn.), L. D. Hartson (H.), and G. H. Shafer (S.). All of these observers sing; H. is a vocal soloist. Fs. plays both piano and violin. R. and F. play the violin and H. the cello. W. has studied both piano and the voice but plays and sings little. C. and V. have studied no instrument. S. has sung in choirs, has taken a few lessons in singing and plays organ and piano in desultory fashion. As to ideational type, R. and V. are predominantly visual-motor, their auditory imagery is negligible. C. and S. are motor-visual with little if any auditory imagery.

H. and W. are motor, auditory, visual in the order named. Fn. and Fs. are of the balanced type with auditory imagery occupying a more important place in their ideation than is the case with any of the other observers. Especially does this hold true in the case of Fn.

IV. RESULTS

I. PHYSIOLOGICAL

Our plethysmographic and pneumographic records were undertaken chiefly for the purpose of controlling our introspections; but the physiological changes which were revealed are themselves of interest.

A. *Volumetric Changes.*—The act of listening to music was almost invariably attended by a decrease in the volume of the fore-arm; this phenomenon occurred in ninety per cent. of our cases. The decrease occurred almost immediately,—within two to five heart-beats after the music began. Certain auditors are characterized by the fact that this initial drop in the volumetric curve is abrupt and precipitous; while in other auditors the change of level in the plethysmographic curve is always gradual and of relatively slight amplitude. It is an interesting fact that the former group of auditors are more active, more alert, more volatile, while the latter group tend to be more indifferent, more phlegmatic, more deliberate. The subsequent course of the curve assumed one of several forms: it either remained at a low level throughout, or it gradually rose to about the initial level and there remained, or it ultimately attained a height above the level of the fore-period. In addition to these changes in the general course of the curve, it frequently happened that the plethysmogram showed a brief undulation, in an upward or downward direction, at some point in its course.

The writer is convinced that these volumetric changes are essentially phenomena of attention; it proves to be possible, in every instance, to correlate these characteristic changes with changes in the nature or condition of attention. After the experimenter had obtained an insight into the individual differences among his auditors, and had acquired experience in the interpretation of his plethysmograms, he found it possible to predict what phenomena of attention would be described in the auditor's introspection. For instance, when the volumetric curve, after its initial fall, continued at a low level throughout the observer never failed to report a constant, continuous and intensive concentration of attention; abrupt undulations of the curve coincided with abrupt variations of attention or rapid flittings of attention from one objective point to another; a return of the plethysmographic curve to its initial level indicated the presence of relatively passive attention, and an ascent above the initial level is correlated with reverie and dreamy states.

B. *Heart-rate.*—The heart-rate was usually accelerated during the music-period. This acceleration began during the first few seconds, and was usually maintained throughout the whole music-period. There was, in general, no correlation between the tempo of the music and the change of heart-rate,—even the slowest musical tempos, which were much slower than the normal pulse, produced an acceleration of pulse, and the most rapid tempos had no more accelerating effect *per se* than the slowest tempos.

The normal heart-rate (fore-period) of our auditors varied from day to day,—one auditor varying between the limits of 63 and 88, another between 72 and 92. The rate during the fore-period exceeded the rate during the music period in less than ten per cent. of the cases; and it

was found that in all of these cases excepting one the rate during the fore-period had been abnormally high.

This phenomenon of acceleration of pulse proved to be so frequent and so independent of the tempo of the music that we were led to suspect the influence of the suspense and expectation of the fore-period, and perhaps even of relaxation, during the music-period. Accordingly we compared the heart-rate of the first minute and of the second minute of the music-period with the rate of the fore-period. We found that the first minute showed an acceleration in eighty-five per cent. of the cases, and the second minute, in eighty-one per cent. of the cases; the first minute showed a retardation in nine per cent., and the second minute in eleven per cent.; the heart-rate remained unchanged during the first minute in six per cent. of the cases, and during the second minute in eight per cent. of the cases. Our records show no constant correlation between heart-beat and rhythm; and a correlation between tempo and heart-rate is found only in those musical compositions where the observer reported that the rapid tempo produced an exciting effect.

C. *Respiration*.—The most striking changes in the respiration of the music-period are acceleration of rate and irregularity of amplitude. We have been able to discover no relation between increased rate of breathing and musical tempo. In certain auditors the accelerated respiration is also more shallow; in one case there is little or no change in depth, and in certain other cases the amplitude of respiration is so exceedingly irregular during the music-period that it is difficult to compare it with that of the fore-period. A comparison of thoracic with abdominal respiration has revealed no striking or illuminating differences.

In certain of our observers, changes in respiration were by far the most striking physiological effects of music. Those auditors who were characterized by active attention breathed in more rapid and shallow fashion than during the fore-period; while in those auditors whose reaction was essentially emotional, respiration was exceedingly irregular both in rate and in amplitude. (See plate F.) In the latter auditors the respiration tends to 'follow the music,'—to accelerate, to hold, to retard, when the music accelerates, holds or retards; and these variations in rate of breathing are attended by corresponding variations in depth.

No correlation between respiration and phrasing was discoverable in the records of our investigation. But an additional series of experiments was arranged for the purpose of determining whether such a correlation is present when the auditor attends especially to the phrasing of the composition. Here it was found that the beginning of each phrase coincided either with the beginning of an expiration or with the beginning of an inspiration,—the former occurring much more frequently than the latter.

Our plethysmographic findings, and our interpretation of these results are in accord with the statements of Angell and Thompson (89; 67 ff.). Our interpretation of the abrupt alternations in the volumetric curve is in agreement with that of MacDougall (103; 165). Stevens (108) refers the initial fall in this curve to certain physiological effects which are produced by external stimulation; and while it is true that in our experiments the fall was usually abrupt in proportion as the musical stimulus was intensive, yet our introspections indicate that initial as well as subsequent changes of level of volumetric curve find a much more thoroughgoing correlation with changes

in the auditor's attention than with changes in objective conditions of stimulation. We do not feel that our investigation can furnish evidence as to the nature of those physiological processes which attend the emotional states of pleasantness-unpleasantness and excitement-calm. Under the conditions of our experiments, these emotions came to consciousness in such highly complex form, and such great variations of attention were involved, that the contribution made by the isolated action of any single factor could not be determined.

Our results regarding the effect of music upon heart-rate confirm the findings of Binet and Courtier (111) and of Shepard (106). Mentz (104) however reported that the pulse is retarded when the auditor's attention is passive. We cannot assent to this statement. It is true, however, that if while listening to music the observer's attention is at first active and subsequently becomes passive, his heart-rate will be found to be slower during the latter stage than during the former; but even during the latter stage the rate is faster than it was before the music began. Our negative correlation between pulse and tempo is in opposition with the views of Riemann (28) and of Steinitzer (19), both of whom assumed that the normal pulse is the criterion by reference to which we estimate rapidity or slowness of tempo. Indeed Hallock (79) has carried this so far as to compute the normal heart-rate of Beethoven from an analysis of his sonatas. But we have wholly failed to find any correlation between rhythm or tempo and pulse. In musical productions the length of the rhythmic group varies in consequence of acceleration, retardation, rubato, pause, forced accenting of tones: the pulse does not respond to these variations.

Although in confirmation of the findings of Dogiel (112), Leumann (102), Mentz (104), Meumann (65), Squire (69), and others we have found that respiration is disturbed by auditory rhythms, yet even here there is no constant correlation or coincidence between the auditor's respirations and the rhythms which he hears. The nature of the disturbance is rather a departure from the regularity of normal inspiration and expiration; and this divergence is proportional rather to the intensity of emotion than to the nature of the objective rhythm. Our observation that respiration conforms to the phrasing of the music, when attention is directed to the phrases, supports the contention of Riemann (28).

The respiratory function is more peculiarly adapted than any other function of the whole bodily musculature for the execution of those empathetic and sympathetic movements which are emphasized by the advocates of *Einfühlung* and *innere Nachahmung*. And it is in variations of respiration that one would expect to find that these variations of pause, retard, acceleration and rubato can be imitated as by the bow of the violinist. A survey of the pneumographic records which are reproduced at the close of this paper will show that all of these variations of respiration are illustrated in our findings.

2. INTROSPECTIONS

Our introspections reveal the fact that the 'music consciousness' is made up of a mass of kinaesthetic and organic sensations, motor, vocal-motor, auditory and visual imagery, numerous associations many of which are irrelevant, affective and emotional processes, and various phenomena which have to do with intellectual enjoyment. We shall analyze this material under the following heads: A. Visual Imagery; B.

Auditory Imagery; C. Actual or Imaged Motor Reactions;
D. Reactions to Descriptive Music; E. Emotions and Moods;
F. Individual Differences.

A. Visual Imagery

All of our observers frequently reported visual imagery in connection with their musical experiences. Often, however, this imagery was nothing more than that which is ordinarily concerned with thought processes; it had no direct or peculiar relation to music. Many times it consisted of the visualizing of objects which were associated with previous auditory or motor experiences of the individual,—for instance, one observer visualized *staccato* notes of high pitch as bright points of steel, another as sparks of light, still another as drops of rain falling on water; a flitting movement in the music evoked the visual image of fairies, etc. Frequently also, visual images were called up through association by contiguity; one observer reported 'this composition called up a visual image of the surroundings in which I heard the same composition last night.' Such simple associations have no especial significance for our problem, and need not be discussed further.

With three of our observers the visual image may and often does occupy a very important place in musical experiences. Their imagery is much more detailed; it often assumes the form of a drama or story in which an emotive content is clearly expressed. Usually the form or schema of the drama or story shows a striking resemblance to the form or schema of the musical composition.

Observer R.—Spanish Waltz, Band. 'I was in a ball-room, not dancing but in evening gown. It was a military ball with a military band; officers and women were there. When the music began, I saw a dance which I had never seen or danced before, but it was appropriate to the music. First, each couple danced two turns together, then jumped. Then the man of one couple took two steps to the left, the girl two steps to the right, and the *vis-a-vis* couple approached and passed between. Third, the first couple came together and the second pair took the place which originally had been occupied by the first. The former pair approached and passed through as before. Every one was laughing and having a good time, because it was a new dance. Then I saw another dance; same surroundings. A man moved toward a woman and made a courtesy to the movement of the music; they did not turn but went backwards. This was done slowly—very slowly. I could not get the exact step; I could not follow it though I tried, because the lady's dress attracted me so much. When this dance was over, the original couple were standing in their original position, and each person made a low courtesy. Everybody seemed to be waiting for something; all were standing in a row. Suddenly the first dance began again; but now there was a slight variation because they were not standing in exactly the same positions.'

An analysis of the above image or scene reveals the presence of three distinct dances; the first, lively and accompanied by much laughter; the second very slow with no turning but with courtesies; and the third, a repetition of the first. A musician will instantly recognize this analysis as a good description of that form in music known as Simple Ternary,—a form in which many compositions of this class are cast and which is usually described as consisting of three sections, the third a repetition of the first, and the second in well-marked contrast to the other two. If we represent this form by the symbols A B A, it will be clear that the first dance of the image lasted throughout the first A of the music; the second dance occupied the B of the music; and the third dance, the second A. So far as the observer was able to recall the exact movements of the dance, they coincided with the phrasing of the music; the place in the first dance where the participants 'jumped' is clearly suggested by a 'wide interval' ascending in pitch at the close of the phrase.

Observer R.—Thomas, Mignon Gavotte. String Quartette. 'When the music began, a friend appeared by my side. Near by was a hotel containing a little theatre. We were looking out of our window, and through the window of the theatre we could see everything on the stage. Women were on the stage singing; their faces expressed emotion; they seemed to be telling something but before they got to the point, they changed their minds and stopped. We were so far away that we could not hear the words but we saw them acting it out. Then men approached upon the stage; they sang the same thing, and stopped just where the women had stopped. When the men had finished, the whole party left the stage except one woman and one man. She began to tell him of her love but stopped and left her recital uncompleted as before. Then they both sang in duet to the end. All was happy and gay. We enjoyed it thoroughly; we could not refrain from giggling as we looked on the stage and saw the performance.'

(When the observer had finished her introspection, she was released from the apparatus and the music was played a second time for the purpose of determining exactly at what point in the selection each change in the observer's picture had made its appearance. It was found that the setting (picture of a stage) had been suggested by the opening chords of the music. The observer was entirely unable to explain why the setting should take this particular form; she reported, however, that *pianissimo* effects always suggested distance,—'It is far away; I am not there.' She could recall no experience in her life which could explain why this particular group of imagery now came to her consciousness except that once many years ago, from a fourth story window, she saw a procession upon the street. After the opening chords, the song of the women continued until the repeat; at this point, the men took up the strain and sang to the end (double bar). The contrast section was pictured by the observer as being not vocal but instrumental, during which the chorus withdrew; and during the

recurrence of the first section, the two voices carried the melody which had formerly been sung by the combined male and female chorus.)

Observer V.—Bizet, Pearl Fishers. Military Band. 'I saw street Arabs in the Midway;—then I saw soldiers dressed in electric blue; sometimes it seemed like a circus parade—then like a military parade. The scene changed toward the end, and I seemed to be in a church. I heard the organ but could not see the organist. I saw robed figures; as they marched, something swayed back and forth, maybe censors. Near the end where the heavy chords came, I thought of a triumphal anthem and 'I went along with it.' In the next experiment, five days later, this composition was inadvertently played a second time. The robed figures came in as before; but on a stage instead of in a church. 'The priests came on the stage, the pipe-organ was on the stage; I did not feel the triumph, but I felt a solemn thanksgiving—not exultant as before. I think the change was due in part to a change in mental attitude; all the sincerity of it was gone. Before, I lived it. Then the priests were in church, they were really celebrating a triumph in the Middle Ages. Now, it was acting on the stage.'

Several features of these introspections and of numerous similar introspections which might be cited, are significant.

(1) The imagery is invariably full of movement; this is characteristic not only of every visual image of this type reported in this experiment, but also of visual images in the preliminary experiments. (2) These movements always bear a direct relation to the 'movements' of the music,—such as rhythm, phrasing, etc., often changes in pitch where such changes are characteristic. In the case of observer R., we have several times compared the images, phrase by phrase, with the music. The outline of the imaginal experience invariably conforms to that of the music. If the movements of the musical composition are rapid and flitting, the movements in the visual imagery are rapid and flitting. If there is a sudden pause in the music, the movements of the imagery suddenly come to a stop; then as the music continues, the movement of the imagery continues. If the melody of the music is often repeated, the movements of the imagery are as frequently repeated. The fidelity with which the imagery follows the movement of the music may be more clearly seen in the fact that if the imagery is localized upon a stage, as frequently happened, R. never sees the curtain fall. The figures on the stage continue their movements until the music stops; at that instant, the whole imagery melts and disappears like a fairy scene. While no one of the eight observers in this experiment had such complete and such detailed, clear-cut visual imagery as did R., yet the same characteristics are present, even if in lesser degree, in every instance of visual imagery of this peculiarly conformable type. See, for example, that of Fs. below, (p. 275) where the

Indians solemnly shake hands to the rhythm of the music, and where the visual imagery of the Indians on a stage gives place, at a change in the music, to a scene in a stock exchange; or those of V., where a procession in the street changes to a procession of priests in a church,—a transformation suggested, evidently, by chords in the music which suggested the pipe-organ; but both scenes are processions ('the march *Takt*'). There is, however, a vast individual difference in observers as to the number and character of the movements suggested by the music, which are carried over into the visual imagery, *e. g.*, one observer often had no other movement in the visual image than the swaying of a field of wheat, of a tree, etc.

The mood which suffuses this imagery is also of interest. If the music is gay, the visual imagery portrays a gay scene; if the music is a solemn and stately march, the visual imagery has the same character. The expression of the faces usually portrays the dominant or changing moods,—'Girls were so happy,' 'The man was very sad; I could see it in his face.' One auditor insists that this is always *her own* feeling, and that the mood is the result of the music. The visual imagery also frequently portrays the change or movement of feeling in the dimension excitement-repose; *e. g.*, Fs. had a visual image of a group of men waving their hats and selling stocks. 'I never saw a stock exchange, but I was much excited; I could see the excited faces.' R., while listening to a cello solo, visualized a man who was singing 'with more and more feeling.' Instances of such induced feelings and moods are of frequent occurrence in our introspections.

Finally, it should be clearly borne in mind that this visual imagery is entirely involuntary. Observers unite in disclaiming any attempt at trying to invent a story that will fit the music or that will explain the music. Their attitude is rather one of curiosity as to what is going to happen; occasionally incongruities appear which cannot be explained, as for example, 'I cannot imagine why people should dance to such music;' another was much surprised to see lions in a political parade. When asked for an explanation she concluded that the presence of the lions was due to a phrase in the music which might have suggested the roaring of lions.

The observer is often unable to recall any previous experience which will explain the form or content of his imagery. There are exceptions, however, as when one observer reports, 'Music always suggests things I read about as a child; I visualize childhood stories.' In one of the preliminary ex-

periments an observer saw a procession of men dressed in Greek costumes marching in a grove. He added that while a boy he had been extremely fond of stories of the Greeks. On the other hand, another observer visualized city streets, buildings, interiors, individuals and situations she had never seen before. It should be remembered however that she never created an impossible or incongruous situation; and that the details of her pictures were either similar to those of common occurrence or could be accounted for in her previous experience.

Visual imagery seems to be entirely unnecessary so far as the enjoyment of music is concerned. Occasionally an auditor reports that some feature of the image had an interest *per se*; but on the whole they agree that the music occupies the focus of attention and that the image is accessory. On the other hand, there is always the possibility that the possession of such concrete imagery may give definiteness to an experience that might otherwise be vague and abstract. Concerning this, however, our observers were unable to give an opinion.

How are we to account for the arousal of these images which are characteristic of the music consciousness of certain observers? They are apparently sporadic and oftentimes irrelevant; yet it cannot be denied that in certain individuals they contribute to the enjoyment of music.

Wallaschek (127; 120 f.) and MacDougall (137) are the only writers who have attempted to explain the origin of this imagery, although several investigators,—Gilman (130), Downey (128), Lahy (131), Pilo (126).—have reported the presence of imagery which is wholly analogous with that of our observers. Wallaschek refers the phenomenon to the alleged existence of a visual type in music which is comparable with the visual type in ideation in general. MacDougall has recourse to the traditional laws of association,—contiguity, resemblance, emotional congruity. The phenomenon of colored hearing has also been appealed to; but this factor can be operative only in exceptional cases.

The introspections of our observers show that the 'movement' in the musical composition is the essential factor in determining what is the character of the visual imagery that shall be aroused. We have invariably found a most remarkable parallelism and congruity between the variations in the 'pace,' the pitch and the rhythm of the music on the one hand, and the movements of the visualized objects on the other. And this parallelism is no less evident in connection with the general form or the larger unities of the musical composition.

We are convinced that the traditional laws of association are powerless to explain the visual imagery which our introspections have revealed. Numerous introspections which shall be quoted in detail (p. 268) leave no room for doubt that movements,—real or imaginal,—in the body of the observer himself, are correlated with the objective movements of the music; and there seems every reason to believe that these bodily movements determine the direction and the general character of the visual imagery. It must, however, be added that mood (emotional congruity) also plays a part here. But the mood is so intimately related with the 'activity' of the music that the former seems to be a product of the latter. The significance of this factor has been emphasized by the advocates of *Einfühlung*, in its various aspects, and *Nachahmung*, to which we shall recur later.

B. Auditory Imagery

Auditory imagery was reported much less frequently than visual imagery. This may mean either that auditory images were really less frequently present, or that the presence of an objective auditory stimulus constituted relatively unfavorable conditions for the detection of auditory images. In other words, the more intensive,—perceived,—datum may have obscured and swamped the less intensive,—imaginal,—datum. However that may be, it was discovered that those of our observers whose auditory imagery is normally weak and ill-defined tended to report motor imagery during the act of listening to the music.

Four of our eight observers wholly failed to discover the presence of a single auditory image during the whole series of experiments. In the case of the other four observers the auditory images varied in frequency and in significance between extreme limits. One observer reported that their appearance was rare and sporadic; another reported that they were invariably present, usually in great profusion; and the findings of the other two observers fit in between these two extremes. In one observer the essential content of consciousness consisted almost exclusively of auditory imagery; his procedure throughout consisted in "playing with his tonal imagery,"—in recalling the notes which had just been heard and in anticipating the notes which would follow,—both in auditory terms.

Obs. Fn.—'I 'thought' the music; the imagery was vague and subtle; auditory images, with perhaps innervation of throat; I anticipated the sounds before they actually came; when I anticipated correctly, it

added to my pleasure. During the interlude I had an auditory image of the figure played by the first violin, and also of a bass accompaniment; the latter I may have sung, the former was too high for me.' 'The first four tones of the same pitch led me to anticipate that something different must follow. These four were all in consciousness at the same time, as were also the two tones which followed,—auditory imagery throughout; at the end of the sixth note, a feeling of pause with expectancy, a comma as it were; the remainder of the phrase is in apposition; the second half is similar to the first, but I could not analyze the similarity. From here on, I noticed many variations of the original theme; the similarity was there, but the composition was too unfamiliar for me to analyze; I cannot say wherein the similarity or difference consisted; my difficulty here, I feel sure, is due to the fact that I cannot recall; I cannot hold the variation together to compare it with the original theme; I no longer remember the notes which are just passed; I was conscious of no innervation of the throat; but I cannot now call up the theme without vocal movements. I had difficulty with the first of the two abrupt pauses in the composition; I went on with my auditory imagery while the music held, and it all disturbed me; at the second hold, I paused; I had a vocal motor image of "I should have known better," and smiled when I remembered that as a child I had sung through a pause in just this way. During this time, the music passed out of the focus of consciousness for a few bars; indeed, my attention fluctuated several times in this fashion; there is much pleasure in the recognition of the transformed *motifs*. It frequently happens that several tones have come before I catch their relation to the original theme.'

'About twelve measures after the interlude I enjoyed the entrance of the tenor of the harmony a third above the air but a variation. I hummed the tenor part at first, then I began to predict the next note; this was auditory imagery; I did not have time to vocalize. I just listened, anticipated, compared. All this was in auditory imagery. I had no other thought than the music itself. I listened, compared phrases, expected what was coming, all in auditory imagery, but when the cello came I could not help vocalizing. I made no noise but felt the strain. I thought the cello part was fine; it was such a good contrast. Then my mind drifted away. Near the end I noticed particularly the sequences. I knew that the composition was working up to the end,—to the climax. Often throughout I predicted what was coming. I call up in auditory images what I have just heard. I measure the duration of each tone and compare each tone with the other.' (See also p. 287.)

Any attempt to interpret these findings leads us at once to a discussion of such questions as the perception and the recognition of motives, harmonies, melodies, etc., the analytic attitude of the auditor, the basis of auditory memory, and the like. And while we can not hope to furnish a final solution of these much vexed questions, it does seem that our findings throw light upon these problems.

Inasmuch as all of our observers had had a life-long experience of Occidental music, their attitude toward musical compositions had already become a highly complex, a definitely established and a deeply-rooted product. For this

reason it was obviously impossible for us to hark back to primitive and pre-experiential conditions; in consequence we have been unable to trace out the genesis and development of such complex perception of melody and harmony in so far as that perception involves tonal relationships, consonance and dissonance.³

The art of music demands that successions of sounds must be apprehended as groups; and the ability to apprehend successive stimuli as groups presupposes the ability to retain in consciousness, or to recall to consciousness, those elements of the group which have already been heard, i.e., a *sine qua non* of the rhythmic group is that the first element should not be lost to consciousness before the last appears. It is obvious then that auditory imagery may be of distinct service in the appreciation and enjoyment of music. It is of course not our purpose to raise the question as to whether auditory or indeed other imagery is indispensable to the appreciation of music; the question of the indispensability of the image in such functions as perception and recognition has already been answered by psychology in the negative. Yet the function of the image in difficult and non-mechanized recognitions need scarcely be mentioned. Nor does it seem necessary to show that the auditor who possesses a profusion of auditory imagery will *ipso facto* be better qualified not only to detect the recurrence of *motifs*, but also to appreciate the composer's modifications and exploitations of his original *motifs*. It is of course true that the auditor who is characterized by a dearth of auditory imagery may have recourse to indirect means,—to surrogate imagery or to certain other make-shifts.

Those of our observers who reported no auditory imagery were yet able to recognize melodies, and to detect the re-entrance of *motifs* and phrases. Their procedure was of several typically different sorts. One observer adopted the expedient of visualizing the pitch-outline in graphic form. Others made use of their motor reactions; they either imagined or executed movements which conformed to the accentual relationships of the *motif* or the theme. Still others employed the emotional tone,—the plaintive, weird or joyous character,—of the *motif* as a criterion for recognition. But these are, after all, indirect means for the accomplishment of

³ The reader who is interested in these problems is referred, for a general treatment, to Titchener (52; 360), and for a more detailed discussion, to Lipps (14, 450), Stumpf (48, 49), Wundt (53; 138), Max Meyer (47, 456), Lalo (11, 184), Bingham (45), etc.

an end; and the composer's development of his theme proceeds in such subtle fashion that its minuteness of structural detail cannot be perceived by the auditor who has grasped but a single feature of the original *motif*. It is, in our opinion, not merely a remarkable coincidence that the observer who was characterized by the greatest facility in the use of auditory imagery was also characterized by the keenest capacity to apprehend the structure and significance of musical compositions.

Our introspections show, however, that a profusion of auditory imagery is not the sole essential for the appreciation of musical compositions. And the very fact that the attitude and procedure of our several observers manifested such typical individual variations as they did, threw the function of the various component processes into high relief and thereby facilitated our work of analysis. These several attitudes and procedures may be represented as series of increasing degrees of intellectual analysis. In those cases where the analytic characteristic was present in least degree, attention was always claimed by some other feature of the composition or its emotional or associative constellations. The observer in whom the analytical attitude was habitually present in high degree was found to assume a wholly different attitude when for any reason the composition failed to furnish an interesting problem or situation for analysis. For instance, a burlesque upon a popular melody soon ceased to claim his attention; and he wandered off to an irrelevant train of associations. But these observers reported that such an attitude was present only in exceptional cases,—when the composition was inherently mediocre or when it was so novel and complex that its significance could not be grasped, and the auditor abandoned all hope of successful analysis. On the other hand, certain observers habitually assumed an attitude in which the analytic function played a minor rôle; here the emotions and the play of uncontrolled imagery were in the ascendant.

It is clear that the musical phrase must not transcend the limits of the span of attention since the phrase must be apprehended as a unit, although it is itself composed of a number of measures. And it is equally clear that practice and familiarity with musical materials must serve to facilitate the task of the auditor in whom the intellectual attitude is habitual and typical. When a musician listens to a musical composition he has in his mind a mass of material, which constitutes a criterion by reference to which the composition

is to be interpreted. He knows the laws of melody, of counterpoint, the construction and progression of chords; every tone of the melody, every chord in the harmony has a name which is of service in its recognition; he knows the musical forms,—fugue, sonata, rondo, and as soon as the form is recognized, he knows further what to expect. Moreover he is acquainted with every means to which the composer has recourse for the furtherance of his musical thought,—augmentation, diminution, transposition, inversion. All of these technical devices become symbolized, as it were. The concrete auditory image upon which all his experience is based tends to drop out and the symbols take its place. The whole mental process becomes complex. All previous experience, education, environment, mental type, go to form the general attitude, the *Einstellung*, which the individual brings to the enjoyment of music.⁴

C. Motor Reactions, Actual or Imaged

Bodily movements, actual or merely imaged, were reported by all observers save one, and she invariably reported visual images which were themselves full of movement. An analysis of the introspective material shows a motor reaction to the rhythm of the measure, a motor reaction to the rhythm of the group or of the phrase, and certain correlations between muscular movement and tempo (rate of speed). One of the interesting problems resulting from the study of this material is the correlation between the objective movements suggested by the music and imaged or actual movements executed

⁴ In addition to the intellectual attitude which is described here, and to the emotional attitude which will be discussed later, it seems possible to differentiate certain other typical attitudes in listening to music. Gehring (22; 49 ff), Norton (125; 190), and others have described the 'symbolic' or 'idealistic' attitude. This *Einstellung* is represented in those auditors who regard musical compositions as an expression, in symbolic language, of human emotions and activities. For instance, musical discords are symbolic of human discords, the complexities of musical structure symbolize human conflicts. The musician who seeks to discover in the compositions of any period an expression of the dignity and stateliness of that period, or of the social unrest of the period belongs to this type. But no representative of this type was found among our observers. We did however discover a variant from the purely intellectual type. The typical procedure of this observer consisted in conceiving the phrases as question and answer, as statement and repartee, as interjection, as amplification, and the like. The music took on the character of a conversation; the first phrase began to tell a story, the second phrase interrupted with an interjection; then the third phrase continued the recital only to be interrupted by further interjections from the fourth phrase, etc.

by the listener. In this connection we shall offer some introspections showing a motor reaction to changes in pitch and intensity, a kinaesthetic localization and seriation of tones in space, and the suggestion of approach and recession in consequence of changes in intensity.

a. *Reaction to Takt*.⁵ Motor reactions to the rhythm of the measure are illustrated by the following excerpts from our introspections:

Fn. 'I felt a strong tendency to move my head with the music.' 'I noticed a tendency to keep time with my foot; my foot stopped when the music held.' V. 'A tendency to move my eyes rhythmically; my eyes are inflamed so that I can feel the pull of the eyeball.' H. 'I noticed the motor sensations throughout,—in hands, fingers, head, upper arm. Near the close I thought of a waltz and had slight innervations in upper leg.' 'Found myself keeping time with my teeth; transferred it to biceps, then to my toe.' Fs. 'I marked time all the way through except at *cadenza*.' 'I marked the rhythm with both feet; one foot marked the first beat of each measure, the other foot the remaining three beats. There were also slight innervations in the left hand.' 'The whole thing was full of movement; a flashing visual image of the experimenter beating time, of a band master, his whole body alive, tense and alert, muscular sensations of dancing myself. I beat the time with right hand, with both feet at times, at other times with only one. A more decided kick with accented notes.'

Introspections follow showing a tendency to execute movements of swaying and swinging with the music; this movement was not in unison with the *Takt* but was in accordance with the first accented member of the group, or with the larger rhythm of the phrase.

Fn. 'I swayed, felt as if the whole body were breathing' (this to the phrases). 'My head rested on my left hand; my fingers were over my eye-brows; when the melody began, my pulse throbbed; I felt a swaying; I could not listen to the music and inhibit my movements.' W. 'I caught myself breathing in exact time with the phrases.' H. 'I felt as if my whole body moved with the swells, like the swinging of the bow of the violin.' S. 'The rhythm became apparent as the music began; I seemed to swing right into it; I had no tendency to keep time with foot or hands; the thing was in my whole body, hardly perceptible.' Fs. 'I experienced a distinct motor image of my arm moving.' 'I got a motor image of two-stepping; I seemed to feel myself dancing.' W. 'Felt as if I were being rocked in a cradle.' V. 'I was conscious of a feeling of rhythm, of swaying like a wash of water.' 'I felt as if there was a movement inside of me, something moving to the rhythm of the music. It is like a sensation of strain, first on one side and then on the other.'

It is significant that in no case did an observer become conscious of the rhythmic experience without experiencing either

⁵ The writer has failed to find a sufficiently definite equivalent for the German *Takt*; and this term will be employed throughout to indicate the measure, or the rhythmic beats within the group.

actual or imaged movements. Not infrequently observers report a conviction that there are movements which could not be localized; in the case quoted above the observer thought she would not have detected the pull of the eyeball in rhythm had her eye not been hyperaesthetic. When actual movements were inhibited one of three things usually occurred. In some cases the rhythmic effect was decreased; in others a tendency to movement appeared in some other part of the body; or, again a motor image or a visual image served as a substitute for the actual movement. In one case after successively moving head, fingers, hand, foot and entire body to the rhythm the observer began to whistle (silently); he found that this action served vicariously for the others; when the whistling was inhibited the hand began again. Occasionally, also, an observer reported that the respiration followed the rhythm of the music; this however is not frequent or long continued since the rate of respiration is too slow for the rhythmic beat of the measure.

This bodily movement to the *Takt* is most evident while listening to compositions in which the rhythmic element is predominant as *e. g.*, the march or dance; and is again stronger in two or four *Takt* than in others. In the waltz often the first beat only is marked, though the second and third beats are frequently marked by individuals who perform music or who dance. In other compositions where the rhythm is less prominent, the motor reaction is usually only to the first accented member of the group or the larger movement of the phrase. The motor reaction to individual notes will be discussed later.

There is, of course, nothing novel in our discovery of a bodily reaction to rhythm. Parry has pointed out that to mediaeval composers rhythm represented physical action, the attribute of the physical body and was, therefore, secular. And while the earlier experimental investigators of rhythm were disposed to postulate a central rather than a peripheral theory of rhythm, most, if not all, of the more recent experimentalists hold that the perception of rhythm is completely dependent upon the presence of kinaesthesia. We do not feel justified in urging our results as a contribution to this general problem since in music there are other factors which cannot be dissociated from the pure rhythmic experience, *e. g.*, bodily reactions to changes in pitch and intensity, associations with march or dance, emotional factor, etc., not to mention the various factors long since pointed out by Meumann. However, our introspections do substantiate a further

distinction made by Meumann (65; 317-319), namely, the difference between the perception of rhythm and the perception of *Takt*. Three of our auditors were never aware of any *Takt* except that of march or waltz; they were always aware of rhythm. For these auditors rhythm is not objective, something in the music, it is subjective, a feeling of their own activity. On the other hand, those auditors who habitually listen to music intellectually always perceive *Takt* in addition to the perception of the rhythm.

b. Reactions to Larger Rhythms. Certain writers, Parry (27; 198ff.), Glyn (78; 192), Bolton (60; 22, 26), Wundt (73; 154), Riemann (28; 33ff.) and others, have discussed larger rhythms in music which are formed by the combining of several groups into a phrase, several phrases into a section or period, several sections or periods into a 'movement,' and finally several movements into a cycle. In the rhythmical idea also is seen the principle of 'contrast,' of 'variety in unity,' the laws of ternary and binary forms, the swing of the tonic harmony to dominant and back again. No attempts have been made to correlate any of these rhythms, except the phrase, with organic or muscular movements. These Riemann has attempted to correlate with respiration,—a correlation which, as we have seen (p. 252) we have been able to establish under certain conditions by an appeal to the kymographic records. We have also reported introspections from six of our eight observers who found larger muscular movements or images which corresponded not to the *Takt* rhythm but to a larger rhythm which we have identified as that of the musical phrases. It will be noticed that the typical experience was a motor image of swinging or swaying.

While it is quite possible that the musical phrases may be distinguished from one another by cadences, and therefore may be differentiated from one another, we are inclined to believe, after a careful study of all the evidence, that the feeling of these larger rhythms is conditioned either by actual movements or by kinaesthetic images. In fact, whenever a composer relies upon rhythm to produce a desired effect, the realization of that effect by the listener is dependent upon the appropriate motor reaction, either in the form of actual, implied or imaged movements.

c. Correlation between Muscular Movement and Tempo. The tempos of the various compositions employed in this experiment were kept absolutely constant; hence the effect of a change in tempo in successive reproductions of any one composition could not be observed. Occasionally, however,

an observer reported that a tempo seemed to be too fast. The reasons given in the introspections are as follows:

V. 'I followed the rapid little places (Herbert's *Badinage*) on my toes. In the slower parts I had a tendency to hold muscles with some suspense waiting for the rapid passages. The music did not please me because it was fatiguing to remain so long on my toes.' Again, 'I had strains all over the body in the first part. The rate was too quick for me; the time of the movement is too fast for me to react to. It is a delicate dance for a person too large, so I found it unpleasant.' Fs. 'I had motor imagery of waltzing, though the time was too fast for a good waltz.' S. 'When the music goes so fast, it is not particularly pleasant. There is a feeling that the performers will not be able to carry it through; that they will break down.'

The reaction of V. to the *Badinage* is of much interest in this connection. The composition, which may be characterized as an alternation of slow and rapid passages, was repeated after a month's interval. In both hearings her reaction was the same. At the close of her introspections, some questions were asked; they with their answers are as follows:

(Do you like fast dances?) Yes, if they are strong and vigorous, but I do not like little dainty fast dancing. (Do you think if you had imaged a fairy as making the rapid steps the music would have pleased you?) I think it would; to me the music was coquettish, I was not in that mood, I did not want to go fast.

All of the other observers enjoyed the rapid passages in this particular composition. One observer imaged young girls as making the movements; another visualized a flitting butterfly; still another 'vaguely projected the rapid little movements in space' (probably eye-movements). The reaction of another was vocal-motor.

In discussing the relation of heart-beat to tempo, we found that a number of authors had fallen upon the normal rate of heart-beat as the criterion between fastness and slowness. (See p. 253.) Since an appeal to the kymographic records shows an increase in the rate of heart-beat for all tempos, and since no correlation between tempos and concomitant rates of heart-beat could be found, we do not feel that this theory can be sustained. The introspections above show why, for some of our observers, the music was too fast. They are three: (1) The music was too fast for the particular motor reaction which seemed most natural for the observer; (2) The music was too fast to be danced; (3) The music seemed to be too rapid for the musicians. To these, other obvious reasons might be added. Musicians know that notes in diatonic succession (scale passages) may succeed one another more rapidly than the succession in larger intervals. This might well be

explained on a motor basis but it is possible that the inherent laws of pure melody may be a determining factor. Again there is the factor of contrast; a tempo of 80 may seem fast after a tempo of 60, or slow after a tempo of 120. Ebbard's experiments seem to show that the introduction either of an emotional element or of additional stimuli may cause the performer to quicken the tempo without being aware of the acceleration. And our experiments have shown that the auditor's judgment of the tempo is equally subject to variation. The human body is not equipped with a physiological metronome, by means of which tempos are estimated in any constant fashion. The only criterion of tempo which we employ is an indefinite 'sense of fitness' whose estimate may vary from time to time without any concomitant variation of heart-rate, of respiration or of other physiological process. And we estimate tempo in terms of our momentary ability to make that motor response which seems to be most fitting for the particular composition which constitutes our stimulus.

d. *Correlations between Objective Movements suggested by the Music and Actual or Imaged Movements on the part of the Listener.* Aside from the motor reactions which we have correlated with the various phenomena of rhythm, there are movements, or tendencies to movement, with each successive tone. The most frequent evidences of these are the mimetic movements of singing or playing. These, however, will be discussed in a later connection. Only those muscular movements which accompany each tone will be discussed here. The tendency noted above to follow the rapid places on the toes is a case in point. Another auditor says 'I anticipated to see whether the note would go up or down. I think there is a tendency to accompany this with the whole body; to ride with it.' 'I noticed that my eye brows went up when the music went up.' 'I got clear visual imagery of a stage, a motor image went up and down.' The visual imagery is full of such movements, the flitting of a butterfly, the various and intricate steps of dancers. We have above noted a case where the dancers jumped at a sudden rise in pitch of the music. On another occasion the same observer said, 'Two Gipsy girls were dancing, making very rapid movements, like flying.'

In our review of the literature we noted the experiments of Féré (94), Tarchanoff (119) and Scripture (118), which seemed to show a correlation between changes in pitch and contraction in muscle. This correlation seems to be generally accepted. Our introspections serve only to show how consciousness is affected by these muscular contractions. Gurney

(23; 140) raises the objection that the succession of sounds in music is often so rapid that a muscular reaction to each sound is impossible. The motor reaction, however, does not imply a complete contraction and relaxation for each sound, but only a partial contraction or relaxation. For example, in an ascending scale passage the contraction might continue from the lowest to the highest note. The apparatus used in our experiment was not devised to record these muscular movements so that we cannot present any objective data concerning them. From a study of the introspections we are forced to the conclusion that whenever musical movement becomes objectified some corresponding muscular movement takes place in the body of the listener. We are of the opinion that eye-movements function largely in the result. The following introspections have a bearing on this general problem:

Pitch.—Fn. says: 'I localize the up and down of music in space; this without visual imagery—it is manual-motor. V. says: 'My first impression of a low note is that it is away off to the left, high note to the right. If a note is prolonged it changes its position in space perpendicularly. When the dentist is working on my teeth there are two kinds of pain—one front, one back. The former has often been associated with me as a high, shrill note, the latter as a low bass note. Yesterday, I bit on something that brought up the back pain; immediately the idea of the bass note came—the auditory image first, then the visual image of the key board.' This she thinks may have come from a childhood association; when suffering with neuralgia her cousin tormented her by thumping on the piano. S. says: 'When music goes up and down, it seems like a stairway. When it goes down three or four notes in succession, I seem to be swinging with it in steps. I think I remember music in that way.' C. says: 'Near the end, I anticipated the notes ahead; it may have been partly auditory but I think it may have been a fusion of auditory-motor. May have been visual—a feeling of steps in two dimensions of space.' R. says: 'When the note went high, a girl who was standing in the middle of the room suddenly raised her arms up high.' (This a visual image).⁶

The case of S. which is cited above is of particular interest. At the close of the experiment he drew diagrams of ascending and descending scales. These were ascending and descending steps; the width of each step is relatively determined by the duration of each tone. These steps are localized in space in purely motor fashion but without any visual imagery. His report that his memory of music is of exclusively motor-spatial character suggests a similar case which has been cited by Wallaschek (127; 126). Squire (69;

⁶ The reader will observe that certain of these spatial localizations which are here discussed under the general heading of motor imagery are visual and not motor: for reasons of economy of space it has seemed wise to discuss spatial localization of whatever sort at this point.

558) reports introspections wholly analogous with ours. "The associations were very frequently of a spatial character; high was 'nearer,' low was 'further away.' Low was 'big' and high was 'thin.' One subject spoke of the high tone as a 'silly little appendage,' another placed the high tone in the top of the head, the other at the base of the skull, and experienced a flipping from the one position to the other as the tone changed." These introspections are quoted here to show that, whether or not from associations, some individuals do objectify tones of varying pitch in space.

The question has often been raised as to the reason why pitches are designated as high and low. The answers are many and varied. This peculiar mode of designating pitches has been referred to the corresponding degrees of tenseness of muscle (Sully, 33, 272; Steinitzer, 19, 18; Combarieu, 20, 128); to corresponding regions of the human body (Goblot, 136); to corresponding positions on the musical staff (Souriau, 18, 305); to corresponding differences of mass, weight and volume (Gurney, 23, 140); to corresponding differences of quality (Stumpf, 50, 189ff.); and to a purely arbitrary origin (Bellermand, See 18, 19). The introspections of our observers show that tones are ordinarily externalized and localized in space, that they are assigned to high or low altitudes in space corresponding to their high or low pitches, and that this process of externalization and localization is characterized by its immediacy and unreflectiveness. This perception usually assumed a graphic form (manual-motor) or a stairway form (visual; pedal-motor). But our auditors have thrown no light upon the means by which they came to perceive pitches in this fashion.

Musicians have themselves recognized the intimate relation between movement and music. They have stated that their art is concerned with rest and motion,—or, as Riemann (28; 1) puts it, with rest, motion and rest. Köstlin, quoted by Gross (8; 21f.), states that music glides, turns, hops, leaps, jumps, dances, sways, quivers, blusters, and storms, and adds that the auditor who adequately reproduced its movements in the physical world must become imponderable or he would be dashed to pieces. But, as Gurney has pointed out, the essential characteristic of music is an 'ideal motion,' not a physical movement. It is evident that the term 'motion' is here employed in two senses, the one objective, spatial; the other subjective; but both depend primarily upon the same factors,—changes in pitch, intensity, duration, and rhythm. The 'ideal motion' of Gurney seems to be a product of two factors,—a motion due to expectation and satisfaction, and a movement of feeling (see pp. 279ff.); and this conception of music may be a purely auditory experience without any objective reference. Our introspections show, however, that for certain individuals the ideal motion is objectified and ex-

ternalized. The music arouses bodily movements corresponding to changes in pitch, intensity, speed, and rhythm; and it is the bodily movements which, we are convinced, are in turn objectified.

e. Other Mimetic Movements. In addition to the sorts of motor reaction which we have described, there are other tendencies to movement which are not directly connected with the rhythmic or other movement factors which are inherent in the music itself. The first of these is the tendency to hum, to sing or to whistle the melody. This reaction to the music gives expression in some instances to pent-up feeling; it is analogous with an audience's expression of its enthusiasm by means of applause.

Fn. 'When the cello came, I had to vocalize; no noise, but felt a strain.' 'I found my throat moving, singing the music. I felt the strain there.' Fs. 'I had a tendency to sing at times, a weak innervation.' 'I had a clear vocal-motor image of singing with her, a tendency to smile with pleasure.' H. 'I wanted to sing the melody. I thought I could not sing the high notes, so dropped to the baritone.' 'Head, arms, legs, fingers, all my body got into it. Soon I began to whistle the tune; this required more attention and legs, arms, etc., stopped as if satisfied.' 'At one time it attracted me enough to make me whistle.' 'I always want to whistle or to sing, no matter what the music. I enjoy music more out of doors than inside because I can sing and whistle.' V. 'In one place I felt my tongue move as if I were going to sing the music.'

This motor reaction appears in another form in those observers who play some instrument. They feel their arms or fingers make the playing movements.

Fn. 'I caught myself bowing my violin with the music.' 'I could feel the pull of the bow, the fingers moving.' 'I felt as if I were trying to play it myself.' Fs. 'I found that my left hand was executing the movements of the right hand playing; kinaesthetic image of playing the violin; the left hand bowed at times.' 'I had a motor image of playing; I could feel the glides and tremulo vividly. I felt as though I were playing the accompaniment on the piano, and trying to keep in unison with the orchestra.' 'I had innervations of playing, in my left hand; I was not aware of my right hand.' 'At low notes I felt myself playing; I knew that they were difficult to play.'

In the introspections of Fs., the images of playing were always confined to the left hand; they were never referred to the right hand, which was in the plethysmograph. In one case, her left hand played the treble part of the keyboard, which ordinarily would fall to the lot of the right, and yet the introspections show that she was not conscious of her right hand; *i. e.*, this interesting phenomenon seems to be a product of *Einstellung*; there was no trace of a conscious

and voluntary inhibition of right-hand movements, or of conscious and voluntary transfer of these motor images or incipient innervations from the appropriate but imprisoned right arm to the inappropriate but free left arm.

The introspections of certain observers reveal the presence of involuntary movements, which apparently are connected neither with the movement of the music nor with mimetic expression, but were more like muscular twitchings which the observer could easily inhibit. The plethysmographic tracings of two observers revealed involuntary movements of which the observers were not conscious.

f. Motor Phenomena of Expectation and Satisfaction. Invariably our observers, reported respiratory and other motor concomitants of expectation and satisfaction. It is probable that expectation is present more frequently, though in a less degree, in the case of the hearer who follows the music analytically; but it is also found in the case of those auditors who listen more passively. So long as the rhythmic or melodic flow is uninterrupted, the attention of the hearer tends to be more passive. But if the rhythmic flow is interrupted, if a sudden dissonance enters, if a 'pause' or cadenza is inserted, attention at once becomes alert; and those bodily processes which are under voluntary control are instantly arrested. When the melodic movement recurs, both the mental and bodily processes flow on again. The same phenomena of interruptions and resumptions frequently accompany the hearing of the final cadence of the composition.

Fn. 'I enjoyed the flute cadenza; a feeling of suspense; I felt my whole organism pausing for a moment; the normal flow began again after the first note of the cadenza.' 'The expectancy contained, as one of its components, an auditory image of the forthcoming chord; this has happened frequently but with different degrees of clearness.' Fs. 'I held my breath, and turned my head to listen better.' 'I was aware of holding my breath just before the last movement where the cello holds.' 'Visual image of theatre just before the curtain goes up,—expectation. I was in the orchestra; as the intensity of the music increased, I could see pianist and conductor; saw the lamp flash for the curtain; my feeling of expectation was strong. I think this was due to the music itself, but I am not sure as to how much belonged to the music and how much to the image.' 'Tension throughout; it was hard to localize; lips were parted; felt a tendency to smile; a feeling of stilted breathing; close attention in the long cadenza; held my breath; a feeling of expectancy.' 'There was a feeling of climax about the middle where the six major chords merge into the four minor chords; decided expectancy with intensive tension.' 'A feeling that the end of the phrase was coming. This was partly due to familiarity; slight tension gathered with the phrase: a vocal motor of 'wha—' (what) accompanied by slight facial tension. This was the way in which the question, in the expectancy, presented itself.' H. 'With the

holds, I held, and I pulled up to them.' V. 'Noticed a tendency to keep time with the foot but my foot stopped when the music held; I noticed a tension as we approached the final cadence.'

The following introspections are cited to throw light upon the basis and the constitution of the experience of expectation; many others of analogous import could be added.

Fn. 'I knew the end was coming; thought it was fine; it let me down so easily.' (How did you know the end was coming?) 'From the characteristic sequence of tones. It may be due in part to a memory of other compositions. I cannot always predict; it sometimes stops abruptly.' 'I knew the end was coming; when I heard the *sol*, I knew that the *do* was coming. When the music stopped, I was very quiet and restful and satisfied.' 'After the music, it was quiet, as if the storm had blown over and now all was still.' Fs. 'I knew the music was coming to an end, though I did not look forward to what was coming next.' 'Just before the end, I felt it coming; tensions in my face, foot, heel and toe; my toe would go down on tensions.' 'After the music stopped, an all-is-over feeling as when the curtain goes down; possibly slight relaxation.' 'Was conscious that the music was working up to climax, but I did not work up with it. After the music stopped, I found that I was not tensed in any degree, I could not relax further; the music had scarcely impressed me.' 'Strong feeling of the ending, with regret, because I felt that 'just around the corner' I might recognize it.' (Did you know that the music was coming to an end?) 'Yes.' (How did you know it?) 'There are several stereotyped endings which one can recognize.' V. (Did you know that the music was coming to an end?) 'Yes.' (How did you know?) 'There are certain chords, progressions, that often end compositions.' C. 'I felt that the end was coming; my eye-brows went up; a vague sensation of strain; the sound was in the focal point, the strain in the fringe.' 'At one place I thought the music would cease; I was all attention; thought it would stop; then came a pause—and a feeling of uncertainty; then the music went on again. After this, I felt a settling down as before; a change in muscular feel. When music stops abruptly, I seem to come down with a thud; as it approaches a climax, I rise with it; I get more tense, and then I drop.'

These introspections make no new contribution to the psychology of expectation. They do show however that the experience of expectation is an essential component of musical enjoyment; and they furnish a general confirmation of the recent results which have been yielded from an analytical study of the experience of expectation. The bodily attitude is analogous or identical with that of attention; attention to a mental content is, however, usually lacking. The experience is describable rather as an anticipation, a suspense, or a waiting for what is to come. The attitude assumes different forms and contains different components, in different individuals. In certain individuals the essential content was verbal motor,—an incipient tendency to ask: 'Wha— (what)?' and the like.

Other observers report visual images of persons in an expectant attitude. Others, an auditory image of the expected tones or chords.

D. Reactions to Descriptive Music

As has been indicated in our summary of the literature, musicians and aestheticians in general have frequently concerned themselves with this question: To what extent may musical compositions be employed as a vehicle for communication and expression? Can the composer or conductor hope by means of his art to convey a definite idea, such as a story or the description of an incident, to his auditor?

We attempted to throw light upon this problem by means of a 'descriptive' composition. This descriptive selection (*Voelker, Hunt in the Black Forest*) was an orchestral record. The program or legend which was supplied by the publishers indicated that the selection portrayed the following incidents: the break of day; the birds sing in the forest; chanticleer's voice; the huntsman's horn; the village chimes are heard; the hunters assemble; they start in full gallop; the horns sound the halt; at the forest blacksmith shop; the smith at work; they start again; the hounds scent the game; in full cry; the game is run to earth; cheers; *finale*. The title of the selection and the descriptive legend were of course withheld from the auditors; they were simply asked to listen to the music and subsequently to report their experiences. The following are the introspections.

Fn. "At the outset I concluded that it was a 'barn-yard' selection; then I paid no attention to it although I heard the sounds throughout. I wondered how they make the dog bark. Toward the end, I began to analyze; and from there on I rather enjoyed it."

V. "I was puzzled to know what it was all about at first; I thought it was the opening chorus of 'Woodland' (a popular musical comedy). I had a visual image of a stage with the sun coming up; Chanticleer and the birds coming together in chorus; there was much movement and streams of light quivered when the sun came up. Then I went to the circus; this occurred when I decided that it was not 'Woodland.' I saw a saw-dust ring. When the anvil sounded, I saw some object flying around the ring; at the stroke of the anvil this object was in the fovea. It was like swinging a chestnut around on a string; the entire circle you see, but at one place it seems to be more clear; and this place seems to give the impetus for continuing the movement. I noticed a number of animals. After I had seen the animals, etc., I was aware of a muscular tension in my right arm; I tried to relax it slowly. Just before the music ended all the people got up and crowded out; dogs appeared in the distance. Attention was more active than usual; more attention and less mood than in the other experiments. At the instant when the shout came, the audience were rising from their seats. No effort whatever was required to bring up this picture; it just came. I saw horses and dogs running around the ring. It was a circus, and one place was like a galloping horse. The bell (village chimes) in the beginning disturbed and confused me. I inferred that the sun must be going down. It ought to be evening but the sun was not going down; it was coming up; it may have been the twittering birds that suggested the sunrise. The opening scene of 'Woodland' depicted an evening setting. There was something about the crowd and confusion that may have accounted for the tension in the right arm."

Fs. "In the fore-period, I was conscious of intense anticipation. When I heard the cuckoo, it aroused a visual image of a cuckoo clock and a cuckoo whistle; also of a bugle. The minor music aroused an image of Indians; a cheap stage; Indians stealing about the stage; a sensational mock-murder; a fierce grin as if they enjoyed it. Then a moving picture image of Indians. Something sounded familiar; much excitement; the Indians entered again in a row, but instead of coming through the wings they entered from an incline so that I could see first the head, then the shoulders; they had the same fierce grinning expression on their faces; they shook hands in time to the music, lifted their knees high and stamped. A feeling of amusement such as I have had in a badly played melodrama. Visual image of a group of men waving their hats; also men standing above, selling stocks. I never saw a stock exchange, but I was much excited; I could see the excited faces. Suddenly it turned into an auction sale. This was followed by a motor image of a dance where the bones were used in the music. I distinguished the barking of the dogs, around the auction sale; there was still much excitement. As I realized the end was coming, attention decreased rapidly; there was no pleasure as before; I enjoyed it in a totally different way. There was 'something doing' every minute throughout the selection; excitement, complex of muscular strains, verbal imagery, New York Stock Exchange, and a very weak vocal-motor innervation of 'New —', a verbal image of Bernhardt. (Did you notice the rooster crowing?) Yes; and a vocal image of the word 'rooster.' (Did you notice the church bell?) Yes, decidedly; and had a visual image of a church tower. Toward the last I wondered about the instruments used:—'How in the world did they produce that effect?'—a faint verbal image. After the music stopped the barking dogs made me think of a vaudeville performance which I saw during the vacation; I was bored then and I felt bored here. That feeling vanished with the image; then I smiled and laughed aloud at the ludicrousness of it all."

W. "In the fore-period, I held my breath for a long time. I saw the gypsy scene in Carmen. It was dawn; when the bird calls came, I thought of a comic opera called 'Woodland,' in which the actors were all birds. I recalled one of the duets, 'Between a Cold Bottle and a Hot Bird,' then thought of Rostand's Chanticleer and wondered if it were like Woodland. I then went back to Carmen, where the stage fills up from the cigarette factory. I had all sorts of motor sensations in my hands, feet, legs, everywhere. There was a queer racket in one place like rolling a hollow box; this took me to an amusement park, on the Coney Island order, where I saw all the shows, etc., particularly 'Shoot the Chutes.' Then the dogs came in, and I went to the circus; there were three rings—trained dogs, horseback riders, etc.,—a complete mix-up until the end, with tendencies to move throughout. I saw clowns in all sorts of costumes and it was they who did the shouting at the end (cheers of huntsmen in *finale*); I also saw riding-masters whipping their horses. The dogs made me think of the blood-hounds chasing Eliza in Uncle Tom's Cabin. In my opera picture, no one spoke or sang,—people just moved about on the stage."

R. "When the music first began, I got a picture of a *Plärer Messe*—'shows' of all kinds. In the distance, a church-bell was ringing. Music was playing at one of the 'shows' where the details of a murder were being exhibited; 'spielers' were talking; while moving about, I saw a menagerie and as I passed by I saw snakes, lions and dogs. The bells were still ringing outside; all music stopped except that of

the merry-go-round. I saw a riding school; two men in front noisily announcing their attraction; I went in; there was only a little music. I then went into the menagerie; I saw a woman in light blue velvet who was performing with the lions; she put a ribbon around their necks; then suddenly ran, the lions after her, but she got out. A big dog, always barking, came out and ran about; a man tried to catch him but never succeeded. The chase was amusing. In one place, he nearly caught the dog and everybody yelled; but the dog got away and then everybody laughed."

H. "I could not understand what the music meant; I thought the melody was very queer; I wondered if it were Oriental because there was no rhythm. Then it fell into rhythm, and I realized that it was a descriptive selection. I concluded that somebody was making all this noise intentionally. Just before the dogs began to bark, I realized that it was a hunt. Once in a while, amid all the noise, I could hear the band like a tin pan; however the dogs made so much noise that one could not hear the music well. I lost interest; finally when it stopped, I said 'Bah, any band can do that.' One place attracted me enough to make me whistle for a time. I had some visual imagery of men on horseback galloping over the fields with dogs; of a tally-ho also, with a cheap band down to start them off. It was slightly amusing but it did not appeal to me favorably as a musical composition. It occurred to me that many people would like such mediocre stuff."

S. "The music came gradually and there was more visual imagery than usual. Near the beginning of the selection there were a number of whistled notes (probably suggested by the twittering of the birds). I saw the mouth of the person who was whistling. I heard the tramping of horses, and had a visual image of horses trotting toward me. I felt the increasing tenseness; then as my visual picture disappeared, it seemed to get smaller and smaller,—this because the music became less clear. The noise and din which represented a battle brought some excitement; and I also felt excitement when the horses came trotting up. The images of the battle were more like a picture; the armies were standing, but individuals were moving; near the end, one detachment of the army was falling back. (Did you hear the rooster?) No. (The bells?) Yes, I saw bells, silver bells. (Did you hear a dog barking?) No. (Did you hear any shouting?) Yes. (Did you have an image of it?) Yes, I saw a flag and around it a group of men who were waving their arms. (Did you hear the bugle?) Yes. (Did you notice any tendency to move your body?) No. (Were you conscious of any of that 'dragged feeling' which you reported on former occasions?) No; I followed the picture all the way through. (Can you account for the fact that there were more visual images to-day?) The music was more descriptive. (Why do you say that it was more descriptive?) Some music calls up a scene,—some does not. This does. Perhaps the bugle and the bells helped to bring it; they were fleeting; but the moment I heard the horses, I saw cavalry coming."

A survey of these introspections reveals an enormous individual variation in the mental contents of the several auditors. It is true that several of the introspective descriptions contain elements in common: an outdoor scene; songs of birds; animals; the dawning day; rapid and vigorous action, and the like; but the setting or story into which these elements are interwoven shows a marked difference from in-

dividual to individual. One auditor conceived the music to be a portrayal of a battle; another, of a circus; another, of a melodrama; another, of a hunting scene. It is a remarkable fact that even the purely mimetic descriptions, such as the barking of the dogs, wholly failed in certain instances to arouse situations such as the composer and the conductor had hoped to simulate.

These introspections show that the composer is powerless to evoke any one definite mental picture in the minds of all of his auditors. Music is unquestionably adequate to the task of suggesting definite and particular emotions; and without having recourse to a legend printed upon a program it may even on occasion convey certain ideas and characteristics provided they be of a wholly general sort. But even here neither composer nor conductor can hope, without extrinsic aid, to attain any high degree of definiteness or community in the mental content of the several auditors. Clues to a general situation may be contributed through the medium of tonal imitation, of rhythmic suggestion, and the like; but the associations and the constellations to which these clues give rise are, in great measure, beyond the control of the musical stimulus. Music *per se* is able to give definite expression to no more than activity, storm and stress, varying moods of plot and scene.

E. Emotions and Moods

The emotions which were reported by our observers were of varied nature and of varied origin. In not a single instance was an intensive or a long-continued unpleasantness reported,—a fact which may have been due to our choice of selections, and to the temperaments of our observers. It is a remarkable fact that when a selection failed to arouse pleasantness of any sort in any degree, it became so uninteresting that the auditor's attention wandered to other topics. For instance, the descriptive selection failed to appeal to Fn.; his wandering attention was recalled only when the loud barking of the dogs was heard. And even here his attitude was characterized not by such emotions as music ordinarily arouses, but by a query as to how the imitation was accomplished. The same phenomenon of inattention was reported whenever unpleasantness made its appearance, even if for only a moment. The sources from which musical enjoyment is derivable are so multifarious that one is not surprised to find that indifference and unpleasantness have been so rare and exceptional.

The tones of musical instruments, even when presented in isolation, have a distinct hedonic quality. And in numerous instances our observers reported a sheer delight in the timbre of particular instruments. Chords, resolutions of chords, nuances of tones, and the like, were also sources of enjoyment. To these may be added the characteristic motor reactions to rhythms, to runs and turns, to abrupt contrasts of pitch. The mimetic reactions, such as humming, singing, whistling, beating time, playing the violin, piano, etc., which characterized the procedure of several observers, were also found to be distinctly pleasurable in many instances. Those observers who reported a vivid play of visual imagery frequently testified that they derived keen enjoyment from being spectators of these kaleidoscopic changes. When compositions are so familiar as to be already endowed with a wealth of associative supplementations, these associations may themselves contribute their quota to musical enjoyment,—apart from the fact that this very familiarity enables the auditor to enhance his enjoyment by a successful prediction of how the theme is about to unfold. The various sorts of intellectual appreciation give rise to an enjoyment of their own. For instance, the skilled violinist or pianist derives a peculiar pleasure from a display of skill and technique upon one of these instruments; similarly, the auditor who is trained in the technicalities of musical composition appreciates and enjoys the ingenuity and skill which is manifested in the work of the composer. To these must be added the pleasurable emotion which is derived from an idealistic or symbolic interpretation of musical compositions. Two other factors, which we shall call mood, and excitement-repose, are so exceedingly significant for musical enjoyment that a more detailed treatment will be accorded to them later.

Fn. 'I like the E flat cornet when it enters high in pitch; it is a fine spot.' 'Enjoyed every *crescendo*, the nuances were brought out so well.' H. 'I noticed that the music was a cello solo with piano accompaniment; enjoyed the richness of the tones, the high notes of the piano were so clear, felt intellectually that the music was of high order.' Fs. 'The harmony of the first movement was pure pleasantness. No mood. I also enjoyed the tone quality of the oboes.' 'Two long notes in the introduction were decidedly pleasant, they were so exquisitely played.'

V. 'Felt as if I were on the shore watching some reed or plant rise and fall on the water; a vague and dreamy pleasure.' 'The rhythm was so irregular it interfered with my pleasure, I could not dream as I wanted to.' R. 'I never heard the music before but it was beautiful and the dance (visual image) was beautiful. I enjoyed the figures of the dance very much.'

Fn. 'In the fore-period, I recognized it by name and thought it was fine.' 'I used to sing it in the glee club; this morning I tried to sing it but could not recall the words. The boys and the accompanist came as a visual image,—all this during the first two strains. The reaction was essentially emotional, such as old friends bring up when you meet them again.' 'Degree of attention was about that which is usually present when one hears a new composition. I was passive,—a good deal of it escaped me; I could not follow it as I would a familiar selection.' 'My memory of the music gives me an additional pleasure. I analyzed, anticipated phrases, but I knew the selection and did not have to work.' 'The composition was new, I found that it required an effort.' Fs. 'The music came and was immediately recognized. I play it. It was distinctly pleasant; I had a feeling of being master of the situation because I knew what was coming.' C. 'I always enjoy music better after I have heard it. Occasionally, if it is decidedly lyric, I enjoy it as much at first.'

Fn. 'Where the notes are highest and most intensive, I have a feeling of excitement which subsides as the pitch and intensity fall. This has pleasantness as a background.' 'While listening I began to get excited, just as though I was getting ready to laugh; there wasn't any fun in it, just pleasurable.'

Fs. 'I felt a thrill, a decided tendency to smile. There was a slight intake of breath, a tendency to lean forward—a sudden welling up of pleasantness, which suddenly subsided.' Again, 'There was a suspension of rhythm in listening to the cadenza; this was very enjoyable,—accompanied first by decided attention, then relaxation. After this the rhythm came in again.' V. 'Near the end where the heavy chords came I thought of a triumphal anthem, I went along with it.' 'It was exultant, I had a sense of buoyancy, of well-being, my chest felt inflated; I had no tendency to move, but a sense of well-being.'

We have already referred to what seemed to be a movement of feeling, a rise and fall, or an ebb and flow in some such dimension as excitement-repose. The most complete introspections were in consequence of the special instruction to 'attend to the phrases,' though these waves of feeling were reported independently in numerous instances.

Fn. 'The music seemed to be rolling throughout; it worked up to the high notes, then came down not only in pitch but in intensity. Ascending, all is energy; I feel it go up, feel it come down; my own feeling waxes and wanes. This is pleasurable throughout but more than that.' 'I let myself go with the movement and found it more emotional as it went up and down. I got into it on the downward movement. By 'getting into it' I mean I felt it myself. I noticed much kinaesthesia; had sensation in my right arm of moving downward; my arm was quiet but I imaged it as moving down to the right,—moving to a position of rest, accompanied by relaxation. In one instance where a phrase was repeated a third time, I felt the greatest excitement accompanied by a thrill; then the excitement came down to repose. I think 'excitement-repose' would be good terms to express the poles of this feeling. I anticipate the climax before it actually comes and I pull up to it. The excitement is accompanied by some sort of tension; I think I often image this kinaesthesia; at least, I am unaware of actual contraction.'

W. 'There is a decided rise and fall of affective tone; it rose with the climax of the phrase. When the next phrase began there was not so much tenseness. That queer elusive feeling of myself swaying was present about the middle of the composition. At times I seemed to be humming; once I was aware that I was breathing up with the climax of the phrase, and would then start down with it.' 'The rise and fall in feeling was correlated with muscular tension and relaxation. My breathing seemed to be sending the bow (of the violin) up as if the rise in breath was actually motivating the music. I also noticed vague muscular sensations in my limbs, arms, all over the body. Coming down there is a release of tension, a sinking into quiescence; but complete repose is not reached until the end of the composition where there is also a diffused feeling of general satisfaction.'

Fs. 'I noticed slight tension gathering with each phrase; and then, though not always, a relief,—a relaxation at the end of the phrase. I tried to fit up a meaning to the phrases which seemed to be in narrative form; the first phrase makes a statement, the second amplifies, the third is almost the same as the first but with additions. This works up to a climax, with increasing but faint tension. There is relief from tension at the end. I did not experience any emotion in it.'

For the sake of clearness in analysis and discussion we venture to construct, with the aid of the introspections, a general statement or outline of this experience of excitement-repose. Supposing the feeling to be coincident with the beginning of the first phrase, the feeling in the direction of excitement follows the rise in pitch and intensity of the melody, until the end, where the feeling is suspended, *i. e.*, complete rest is not attained and expectation enters. Coincident with the beginning of the second phrase there is first a diffused feeling of satisfaction, and the feeling curve following the melodic outline may be, often is, in contrast to that of the first phrase. At the end of this phrase the feeling more nearly approaches rest; but since it does not reach complete rest, expectation again enters followed by satisfaction at the beginning of the third phrase. Here the feeling curve is often similar to that of the first phrase but of greater intensity, again following the melodic outline which, in this case, rises to higher pitch and greater intensity. Thus we find a recurrent rise and fall in feeling not only in each phrase, but also a larger curve corresponding to successive phrases. This larger curve reaches its highest point at the climax of the movement or composition, after which the melody ultimately returns to the key-note, and complete rest or repose and satisfaction are attained. It is evident that any number of variations of the above periodicity are possible. If now the reader will bear in mind this general outline he will find that the following analysis conforms with the schema and becomes more readily intelligible.

The part played by expectation and satisfaction in the rise and fall of feeling is difficult of analysis. In some cases it seems clear that the degree of expectancy is conditioned, in part at least, by the degree of feeling. In other cases both expectation and satisfaction are present when the rise and fall of feeling is not present, or as the auditor quoted above says: 'There is no emotion in it.' We are of the opinion that the expectancy here is in great measure analogous with attention, and that the degree of expectancy is coincident with

the degree of interest. On the musical side, two forces are at work in the development of the feeling; changes in pitch, speed and intensity; and the effect of tonal relationships. The sinking back to repose is largely due to the return in the direction of the tonic; and expectation is aroused through a temporary break in this movement; but the particular feeling of repose with which we are here concerned is not due solely to the satisfaction of the return to the key note. The difference is clearly seen when the music ends, with a rising cadence, on a tonic of high pitch. Here is felt the satisfaction of having attained the end but with enthusiasm or excitement.

It is also evident from the introspections quoted above that, on the bodily side, the rise and fall of feeling are correlated with muscular tension and relaxation, not only in the muscles of the extremities, but also in the respiratory muscles. The kymographic tracings of the respiration show unmistakably that when attention is directed to the phrasing the respiration follows the phrases. But these modifications in the general musculature accompany expectation and satisfaction when no other emotion than pleasantness is felt. It is impossible, therefore, to say that excitement-repose is conditioned solely by muscular processes.

The most important condition for the origination of this feeling is contained in the attitude of the observer. The following introspection represents a fairly successful attempt to describe the situation. 'The feeling is due to my own activity; I live the music; it becomes identified with myself; I forget everything outside; the music becomes the expression of my own feeling; it is only when I reflect that I objectify the music.' Numerous similar citations from the introspections might be added. It is this empathy that gives significance to the mimetic movements of singing, playing, and conducting, marching and dancing, of the apparent motivation of the music by the respiration, etc. All of these movements may be present in the body of the observer and no emotion result. It is only when the auditor feels himself into the situation, identifies himself with the music, allows it to become the expression of his own activity, that the emotion appears.

In our description of this feeling as of the dimension excitement-repose we have been guided principally by the reports of three of our observers who were asked repeatedly to analyze the experiences. The Wundtian theory was known to all of our auditors, although none have been able to accept

it. They did not know that Wundt has said that tones usually bring out affective processes of the two dimensions, pleasantness-unpleasantness and excitement-depression. Yet in attempting the analysis of this feeling, the Wundtian terminology occurred to one observer, and two others were asked whether excitement-depression would describe their experience. All agree,—and independently,—in substituting ‘rest’ or ‘repose’ for ‘depression.’ Two agree in accepting the term ‘excitement’; one says ‘It is not unlike the excitement in a game.’ Another says ‘It is the same feeling that you have when you want to throw up your hat.’ All believe that it is generically the same as the pent-up feeling that demands expression in applause, shouting, cheering, singing and the like. One observer believes that it is the feeling one has in listening to a fine orator as he reaches his climax. Other expressions have been used, such as ‘fervor,’ ‘interest,’ ‘enthusiasm,’ ‘a feeling of activity,’ etc.

All observers agree in reporting that these waves of feeling are pleasant throughout. They were asked, in a special instruction, to correlate the curve of pleasantness-unpleasantness with that of excitement-repose. One observer reported that, at the beginning, the curve of pleasantness rises with that of excitement; but when excitement falls in the direction of repose, the pleasantness curve remains practically stationary. In other words, so far as he was able to introspect, the feeling in the direction of repose was equally pleasant with that of excitement. In one instance, there was a rise in pleasantness due to the timbre, in another, to an attractive variation of the theme. The writer is convinced that the feelings cannot be arranged into a one-dimensional series without doing violence to the facts. Our introspective evidence justifies the conclusion that the feelings arrange themselves between two pairs of poles in two dimensions of space. One of these pairs can best be described as pleasantness-unpleasantness. The other pair is more difficult to definitize and to describe; the most appropriate terms for this pair seem to be excitement-repose.*

The emotional experiences which our observers reported are to be characterized rather as moods than as emotions in

* Titchener (*Phil. Stud.* XX., 1902, 404f.), Orth (*Gefühl und Bewusstseinslage*; Berlin, 1903. 66.) and others advocate the view that all of the simple feelings will be arranged in a one-dimensional series,—pleasantness-unpleasantness. In addition to these primary feelings, however, they recognize the existence of active or exciting, and passive or calming (depressing) pleasantness-unpleasantness.

the ordinary sense of the term. While it is true that the conscious content of the mood is similar to that of the emotion, yet the temporal course and life-history of the former is different from that of the latter. The emotion is temporary and evanescent; the mood is relatively permanent and stable. Emotions were by no means lacking, of course, but since they were, in the nature of the case, transient and fluent, they seemed, to the observers, to constitute a less significant part of the emotive experience. Nor were the moods wholly constant and unchanging throughout their temporal course. For while it frequently happened that an observer began his sitting with a definite mood upon him, and while he frequently felt that he was incapable of ridding himself of his mood,—which in numerous instances he found to militate against the enjoyment of such musical compositions as did not conform with the character of the mood,—yet it was characteristic of the mood itself that it was subject to transformation. Nothing is more patent from our observations than the fact that the character of the mood varies with variations in the character of the musical stimulus. For instance, so long as the musical composition continued to be made up essentially of strongly accented rhythms, of notes of short duration or of moderate or high pitch, of chords in major keys, the mood continued to be cheerful, happy and gay. But so soon as weak rhythms, sustained notes, notes of relatively low pitch, chords in minor keys are introduced, the mood becomes more or less sad, serious, sombre. And this new mood persisted so long as the music progressed in essentially unaltered character.

It seems impossible from the data at hand to furnish a systematic classification of the moods which were experienced, as the reader will observe from the following list of descriptive terms which were most frequently found in our introspections: happy, gay, lively, joyous, cheerful, exhilarating, playful, restful, soothing, tender, quiet, peaceful, coquettish, triumphant, sad, sombre, yearning, serious, longing, disquieting, restless, unhappy, weird, pensive, mournful, despairing, cheerless.

Fn. 'It was like getting out in a summer's breeze, when you feel like throwing your hat into the air.' Fs. 'The mood was a weird and mysterious longing for something. A mood not of sadness, but inclining toward sadness. I did not know what.' 'There was a feeling of general melancholy meditation. This was not an emotion but a mood, long drawn out.' 'In addition to this was the mood: mock seriousness, the life of a butterfly; all this is emotive, but it is diffused.' 'About the middle there was a mood, a weird sort of a feeling like that aroused on hearing a ghost story; it was decidedly pleasant.' 'The rapidity of the motion overcame a tendency of the chords to sadness. A new

mood came in, due to a tendency to a compromise between the graceful movement and the harmony. The movement was joyous, the chords were sad.'

W. 'This composition would make a lovely lullaby, the swing, the evenness of tone; it is soothing; one has a tendency to become drowsy.' 'The melody has a plaintive tone, a mournful something; the affective tone is sad.' V. 'Toward the close, the affective tone became more marked; the mood which would come on such a night came over me; this was not so strong as melancholy,—pensive, rather. It was not connected with any event, time or place.' 'The effect was very soothing.' 'The mood was pensive, softened,—not unhappy, brooding.' Again, after describing a visual image of a triumphant Roman procession. 'I did not feel the triumph, but I felt a solemn thanksgiving; it was not exultant.' H.H. 'A mood of day-dreaming, sort of sadness, a man disappointed in love, or some such thing.' S. 'It made me feel sad, not unpleasant, but calm, quiescent, a feeling of reverie.'

The question very naturally arises as to whether the same composition induces the same mood in different individuals. In certain introspections (analytical or intellectual) a mood was not always reported, so that comparison is not always possible. In one of the preliminary experiments the question: 'Did the composition give rise to a mood, and if so, what was it?' was asked after each experiment. The names of the compositions and the answers received are here appended.

Hexentanz, *MacDowell*. The contrast section of this composition was wholly different in character from the first section, which induced the dominant mood. Occasionally only a dominant mood was reported for the reason that this mood persisted throughout the contrast section; at other times two moods were present. The replies of the eight auditors follow: (1) happy; ominous; (2) joyous; (3) joyous and happy; (4) spirit of play; (5) joyous, coquettish, abandon; (6) joyous, at times rising to ecstasy; (7) happy; melancholy; (8) joyous abandon; mystery; riot of pure joy.

Étude, *Chopin*. (1) passionate, but under control; (2) like certain Tennyson poems or a water-fall in the woods; (3) active and happy; (4) clear, bright, and sparkling; (5) happy and free.

Nocturne, *Bohn*. (1) indefinite, indescribable mood; (2) lonesome; (3) summer night; (4) soothing; (5) dreamy; (6) loving and pensive; (7) dreamy; (8) suggestion of happiness.

Minuet, *Backmann*. (1) stately and courtly; (2) dignified; (3) active, much vivacity; (4) optimistic but dignified withal; (5) solemn; (6) peaceful, restful; (7) longing and sad sweetness.

It is evident that some of these replies express nothing more than the general action and movement of the composition. But since, after all, it is characteristic of moods that they are not clear, definite, and easily describable, and since, for this reason, different individuals might readily employ different terms to describe moods which are essentially the same, these replies show a remarkable agreement, although of course we would not maintain that different individuals invariably feel the same mood while listening to the same composition. The inducing of a mood depends upon a number of factors: the individuality and the temperament of the auditor; the degree of passivity of his attention; his extraneous associations; and the initial mood which he brought to the hearing of the composition. For instance, one auditor did not like a selection because it did not conform with his mood. On the other hand, the nature of the composition must be considered; little mood is aroused by the Allegro of a Haydn Sonata since it is 'classic,'

formal; it is pure tonal art as opposed to the 'romantic' in music which makes a more direct appeal to the emotions. The timbre of the instrument also plays a part,—the flute does not suggest the mood of exaltation as do the trombone, the pipe organ, etc. With these exceptions in mind, we may safely say that music of a certain sort may easily arouse such a mood as may be expressed in terms of confidence, yearning, imploring tenderness, mysteriousness, lightness or daintiness, elation, joy, triumph, etc.; but in every instance the listener must give himself up to the music and allow it to become the expression of his own feeling. Gurney has often been quoted as saying, 'The yearning in music is but the yearning of one note for another.' It is only when the auditor yearns with the sound, and it in turn becomes the expression of his own inner striving, that the mood is felt. The psychologist would describe this phenomenon in terms of expectation and of empathy.

F. Individual Differences

Certain typical differences in the attitudes and procedures and mental contents of the several auditors have already been indicated. Any attempt to describe or to classify these individual variations encounters a two-fold difficulty, because the types which are here represented are neither wholly discrete nor sharply demarcated, but merge into one another through intermediate gradations; and because the typical differences themselves must be described from various points of view if we are to obtain a complete envisagement of their characteristics. We shall, therefore, endeavor to describe the more prominent traits of imagery, associations, emotions and moods, attention, bodily reactions, and finally, certain miscellaneous characteristics of attitude and procedure.

Observer R. This auditor was characterized by an exceedingly great profusion and a great vividness of visual imagery. These visual images were never static, but always referred to objects which were in active movement throughout,—dancing, marching, and the like. Familiar associations were rarely present, *i.e.*, only in very exceptional cases did this auditor report that musical selections aroused memories of past experiences. Emotion and mood were invariably present in more or less intensive form, although these two mental contents seldom expressed themselves in detectable motor reactions. It is particularly characteristic of this auditor that her experience usually assumed the form of a mood rather than of an emotion. Although muscular reactions were lacking, her visual-motor imagery was exceedingly vivid and definite; she herself was either an active participant in the dances, marches, etc., or an exceedingly interested and keenly observant spectator of these scenes. It should be noted that these imaginal contents were by no means mere memories of the past; unfamiliar scenes, and unfamiliar steps and figures

in dancing were frequently present, and present in such intensive degree that she was able, after the sitting, to demonstrate the novel steps and figures of the dance. It is also characteristic of this auditor that her imagery always assumed coherence and system,—it was always a story, a drama, a dance, a procession, or the like; and it is also characteristic that she herself did not consciously contribute to the inventing of these coherent constructions of imagery; she was merely a participant or an on-looker. Indeed, although intensely interested, she manifested only passive and one-level attention throughout. The following excerpts are typical introspections of this observer; additional illustrations will be found on page 254.

Benedict, Carnival of Venice; Xylophone. 'When the music came, I did not know where I was; soon noticed that I was in a theatre; I thought that a drama was coming; a lady wearing a green dress came in and began to dance. Her skirts flew just like a butterfly; sometimes she jumped and one really thought she was flying. Suddenly a whole group of girls came in and they tried to dance with her. Finally the girls went back and disappeared. Then boys came in, danced like the rest and disappeared. During the last part of the music the woman first danced alone, then the girls came in and danced with her. Their movements were exceedingly rapid,—zigzag and flitting. The figures they formed on the stage were much like a figure eight.'

Hauser, Cradle Song; Cello. 'After one or two phrases I saw a landscape—moonlight, castle with garden, lighted window; could see young people; a piano was playing. Outside a man was singing a love song to the girl who was playing the piano. His face was sad; he would so like to have her hear him. She began to play again; he sang his song again. Suddenly he stopped and turned; his face was very sad. Then another man came from the garden and looked at the man who sang. Then the song was sung again. The singer went to the door and put on his hat; he was dressed like the trumpeter of Säckingen. I could see the white ruchings on his sleeve. At the last, he was standing at the door, looking hopelessly at the floor. He did not know whether to go or not. I was standing perfectly still; I felt with him.' After an interval of sixteen days, the same composition (Cradle Song) was played again. On this occasion, her report was as follows: 'I saw a sunny landscape, houses, gardens and flowers. It was autumn. In one house, a girl was playing a piano and a man was singing. The song tried to express his desire for her to go away with him. His face was unhappy because she refused; he begged her to go; told her how he would feel if she did not go. She was happy, apparently, an ironical smile,—she was probably trying to deceive him. Suddenly he touched her on the shoulder; she looked up, saw his face, and became excited, but in her heart she did not care. His face took on a more hopeless expression; he sang with more and more feeling. Once or twice he felt hope; he thought of the happy future they might have together. At the last, he gave up entirely and put down the music with great sadness. He continually gestured with his head, eyes, and hands; she continually played the piano.'

Observer Fn. In this auditor, visual imagery was almost wholly lacking; and when it did occur, it apparently played an exceedingly insignificant rôle. He almost invariably reported a profusion of auditory images; motor images were usually present, though in lesser degree. The auditory imagery was concerned with the *Abklingen* of notes that had just been heard, or with the anticipation and prediction of notes which were, in his opinion, likely to follow. His motor imagery had to do chiefly with imagined reactions to the rhythm, and in lesser degree, to the phrasing; imagined or executed movements, which are concerned in the act of playing the violin, were also present in some degree throughout. It was characteristic of this observer that he frequently tended to localize pitches and changes of pitch in a graphic schema in external space,—a procedure which was accomplished in purely motor fashion. It sometimes happened that definite associations from the past were present when the musical composition was familiar, but these played an insignificant part in his enjoyment of music; for instance, familiar compositions were enjoyed, not because of their wealth of pleasing associations from the past, but because their familiarity facilitated the auditor's analysis and his prediction of the development of the theme. His attention was active throughout, save in those rare instances where his typical attempts to analyze the composition failed utterly, and where, for that reason, he lost interest in the composition. His emotive experience was usually characterized by the presence of emotions rather than of moods; and his emotions almost invariably assumed a two-dimensional form, pleasantness-unpleasantness, excitement-repose. Moods, however, were not wholly lacking, especially when the less active sort of attention was present. His bodily reactions had to do, in almost every instance, with his own imagined act of playing the composition upon his violin.

The essential characteristic of *Fn.*'s attitude and procedure is describable as intellectual or analytic. He invariably analyzed the work of the composer, and endeavored throughout to understand and even to predict the development of the composition. And his enjoyment of music is determined essentially by the success with which he meets in his analysis and prediction.

Rubenstein, Melody in F; violin and piano. 'My first thought was: 'I heard it last evening;' the whole situation came back, chiefly in visual terms. Then I returned to the present rendition. I began to think the music; simply took it in, and played with my imagery, which

was almost exclusively auditory. Then I thought: 'Pshaw, I am not listening, but after all, this is the way I listen to music.' About the third section, where the bass goes up and down, I vocalized it; I made no sound but felt it in my lips. This composition is interesting to the very end, due, I think, to the rhythm; there is always something new throughout. The *diminuendo* and the *retard* at the end interest me most. When the music was over, I said almost aloud: "O, that's fine, that's fine." Then my attention drifted away for fifteen or thirty seconds. By playing with the imagery, I mean that I recall the notes which have just been heard and compare them with the present notes as to pitch, duration, and intensity. I also anticipate what is likely to follow. I do not follow the notes with my throat, but I simply hear them as if they were still ringing in my ears. This image is very much like hearing the same notes over again. I can readily reproduce the last phrase or two; and I like this reproduced sound even better than the sound which is objectively present.'

The following excerpts illustrate this auditor's kinaesthetic reaction: 'I felt this selection as if I were playing it myself; I could feel the action of the bow and of the moving fingers.' 'Near the beginning, I had a distinct motor image of my arm playing the music.' 'I had an experience as though I were sitting in the orchestra and were myself playing the selection; I localized the up-and-down of the music; this is motor, not visual. I had a motor image which assumed the form of a graphic outline movement, somewhat like the attention curve.'

Braga, Angel Serenade; Violin and Cello. 'A feeling of familiarity when the music began though I could not recall the name. However, I knew it sufficiently well to be able to anticipate what was coming. At first I followed the music very closely, listened, spanned, anticipated, with auditory imagery. When the cello entered I began to vocalize, made no noise but felt the strain in my throat. I thought that the cello part was fine, it made such a splendid contrast. I noticed suspense or expectation at the end of phrases. Then attention wandered, drifted away; I did not vocalize any more; I cannot recall what my thoughts were at this point. Then I returned to the analysis of the music; became aware of myself as analyzing. I anticipated the end of the composition, thought it was fine; it let me down so easily. Attention was fluctuating throughout. The selection was familiar so that at times I drifted in a vague, dreamy way. The mood was quietness, restfulness. There was some excitement near the end; but pleasurable throughout.'

Observer Fs. This auditor reported visual and motor imagery much more frequently than auditory images. Her visual images occasionally but rarely assumed the form of a coherent story, and these stories were exceedingly brief and intermittent. Her motor imagery usually had to do with her own act of playing the violin or piano; occasionally, it had to do with dances in which she participated. The visual imagery almost invariably found a setting in a ball-room scene, or the like; but she also visualized the performers who produced the music. The associations aroused by the music were numerous; they usually concerned the situations in which the composition had formerly been heard; her atten-

tion was intermittently active and passive. When active attention was present, it was concentrated upon the *timbres* of particular instruments, unusual rhythms, novel chord progressions, and especially upon the quality,—excellent or mediocre,—of the rendition. Her emotive experiences were most frequently characterized by pleasantness-unpleasantness; excitement-repose were reported in numerous instances, but sometimes they were not present. The emotive experience usually took the form of a mood when her attention was passive; and it may be added that visual imagery and extraneous associations were seldom present, excepting in passive attention. Her bodily reactions were frequently and intensively experienced; these usually had to do with the act of playing the violin or the piano, but occasionally she reported kinaesthetic imagery and kinaesthetic sensations which were concerned in the experiences of expectation, and of excitement and relaxation.

Hauser, Cradle Song; Cello. 'During the fore-period I was curious as to what the music would be. I recognized the composition within a few seconds; a slight uneasiness before the name occurred to me; then a slight lapse of attention. I seemed to be playing the cello myself, and I was conscious of the difficulty of bringing out the tone upon the cello,—it is so different from the violin; this was motor imagery; had a vague feeling of discomfort in trying to play it; then a dim, visual image of a friend who plays the cello, an intermittent image of him as he appeared at an entertainment last winter; the skillfully performed *portamento* gave me a sustained pleasantness; close attention throughout, but stronger where the pleasure was greater. I usually held my breath a little at the end of movements; the attention varied; more attention when more pleasing; in several places I had a motor image of playing the accompaniment on the piano, a specially clear image of striking the octaves in the bass with my left hand; no imagery of my right hand (in the plethysmograph); clearly conscious of the rhythm at times, and of a tendency to sing at times; toward the close I was very attentive, to the harmonics especially; I knew that it was coming to an end but did not anticipate what was coming next; after the close, a distinct awareness of relaxation; and I lingered on the feeling of pleasure.'

Sousa, Diplomat March; Military Band. 'Concentration of attention came slowly; I realized that it was a march; clearly aware of the rhythm; innervation in the foot and left hand, none in the right hand; visual image of soldiers marching and keeping time, but I did not see any faces; for a time I tried to single out the various instruments; at the change in movement, I had a visual image of the grand march, pale pink and cream dresses, and the black of the men's suits. This scene was not very clear; the line was actually moving; I was not aware of any movements of my own; when the music changed, the figure of the march changed; my attention shifted, and an instant later, I was listening to the flute, the visual picture having receded; later, everybody began to dance; I got a visual-tactual-motor image of the smooth floor under my feet.'

Observer W. This auditor reported not a single instance of auditory imagery; her visual imagery, while vivid, was usually fluctuating and intermittent. Her motor imagery was exceedingly clear and profuse throughout; it usually had to do with singing or with the oscillation of the whole body, floating in space, to the rhythm of the music. Her associations were frequent; they were memories of persons or scenes which had formerly been associated with the familiar musical selection. Her attention was for the most part passive, but occasionally it assumed an active form, especially when she was interested in picking out particular instruments from the orchestra, and when she admired the skill of the performers. The play of visual and motor imagery, with their extraneous associations, usually ran their course in passive attention. Moods were frequently reported, and emotions were invariably present. In these emotive experiences, both pleasantness-unpleasantness and excitement-repose were of frequent occurrence. Her bodily reactions, either imaginal or real, were the most prominent components of her experiences. Various parts of her body, hands, feet, trunk, head were concerned in these reactions; she marked the rhythm, and usually was aware of muscular sensations and imagery in the presence of scale passages, and of abrupt changes in pitch and in rates of succession. Her respiration almost invariably changed in both depth and rapidity with the change in the movement of the music.

Victor Herbert, Badinage; Orchestra. 'This composition was very interesting, both in melody and in rhythm; had no visual imagery until near the middle; felt muscles of face move; music such as this, containing quick steps, followed by slow steps, gives me great pleasure; at the change in movement, I saw boats on the water in the moonlight, the oars keeping time to the music; I heard music and wondered where it came from; I thought it must be from an orchestra on the boat; there was a charming scurry near the end of the selection; my pleasure was chiefly motor; I picked out tones of some of the instruments, noticed the harp especially; did not see the players; I felt the run up the piano scale, but did not see the piano.'

Rubenstein, Melody in F; violin and piano. 'The first thing of which I was aware was a consciousness of pleasure; I felt as though my whole body were swaying without any active movement on my part; I was out in space, not touching the earth. If my body could have been connected with an automatograph, it would have swung to the right for two movements, then to the left for two movements; this lasted throughout; visual image of a friend who plays the violin; she sways a little while she plays; I saw and heard her breathe; at the interlude, I saw her take down her bow and screw it more tightly; I felt my head moving at one passage; felt release from tension when the music stopped.'

'The experience was motor throughout, a distinct tendency to move my head, hands, feet, and fingers, but I believe I inhibited the movements of my hand.' (The plethysmographic record shows that she did not.) 'I felt as though I were being swung in a hammock. Sometimes I have a tonal image which sways, as if the tone were swinging back and forth like a pendulum. The music arouses motor tendencies immediately, first in one shoulder and then in the other, then in legs and feet; finally, a dim, visual image of the dance. I frequently feel as though I should like to dance while the music is being played, and, indeed, I sometimes feel as if I were dancing.'

Observer H. This auditor rarely reported a visual image. At infrequent intervals, he seemed to see the conductor, the orchestral instruments, etc., but these images were vague and fleeting. He very often reported auditory imagery,—parts of themes and motives, and even individual tones, in their appropriate clang-tint. The distinguishing characteristic of H. was his invariable tendency to movements of all sorts,—humming, singing, whistling, beating time, dancing, marching, and the like. Motor imagery was rarely found, and then only of a vocal motor sort; this negative report is probably due, in part at least, to the fact that the actual movements were themselves present. It seldom happened that the music recalled memories from past experience; yet his reactions to familiar and to unfamiliar compositions were characteristically different. In the former case, he attends closely to the music throughout, and he is aware throughout of definite and intensive muscular movements; in the latter case, his attention is not held by the composition, but wanders away to such incidental matters as introspective data which he will subsequently report, to the mechanical perfection of the phonograph and the like. Pleasantness-unpleasantness and excitement-repose are experienced in marked degree. As already indicated, this auditor is characterized by an exceedingly intensive motor reaction to music. He reports that these actually executed movements of all parts of his body are absolutely essential to his enjoyment of music. Music which is heard in a brightly illuminated auditorium or in a dignified assemblage loses its charm because he feels obliged to restrain his motor expression.

Sousa, Diplomat March; Military Band. 'The music came with a bang. I fell in with it and marched down the street; my head, arms, legs, fingers, my whole body, moved with it. Soon I began to whistle the tune; this took more attention, and my legs, arms, etc., stopped as if satisfied. I did not whistle throughout; near the end of the composition, my hand began to move again. I forgot all about my headache, did not care what the music was; did not notice the instruments except that they were all wind instruments, and mostly brass-wind.'

Wagner, Prize Song; Cello. 'The music came gently; it did not dis-

turb me nor raise much enthusiasm. There was little impulse to move the hands or feet or to sing. I realized that it was a cello solo with piano accompaniment; unfamiliar; once or twice felt that I ought to know what it was; realized the richness of the tones; felt that it was an excellent composition. There was a slight twitching of muscle in the upper fore-arm after the first interlude. At the close, my mind was away from the music; near the last I wondered what sort of a selection it was; tried vaguely to recall how many motives there were.'

After concluding an introspection on one occasion, he said: 'There are two kinds of motor reaction,—keeping time and singing. The latter brings in the clang-tint; where these two are combined, I find my greatest pleasure. I enjoy rich, full chords without the time element; this is more static,—the joy of reverie. The former is activity; it is like a long march, where one stops occasionally to enjoy the scenery.' Again, he said, 'I feel as if my whole body moves with the swells of the music, like the movement of the violin bow.'

Observer V. The auditory imagery of this auditor was inconspicuous, although occasionally reported. Her visual images were exceedingly clear, detailed, and frequent; their colors were vivid and striking. She saw scenes upon a stage, processions in the street, etc., where the colors of the costumes and of the musical instruments were richly variegated and of deep saturation. Her motor imagery, however, constituted the major portion of her sensory mental content; these images were usually referred to the movements of her own members, the swaying of her body, etc. Childhood memories were frequently aroused; familiar compositions tended to reinstate former situations. Active attention was almost invariably absent; reverie, day-dreaming, and passive attention in general was characteristic of her attitude toward music. Moods were of frequent occurrence; pleasantness-unpleasantness was almost always present; excitement-repose was also reported throughout.

Pierre, Serenade; Instrumental Quartette. 'Shortly after the music came, I felt as though my body were swaying, but it was not. I was conscious of breathing deeply, and felt a strain at my hips; the swaying was from left to right; I alternately felt the strain on one hip and then on the other; this was not due to breathing but was coincident with it; had a visual image of a field of wheat swaying in the wind; when I attended to the piano and violin, I got the impression of a question and answer in the music; when the violin became fainter, the visual image faded away; also was conscious of rhythm which coincided with the motor image and the visual image; had a distinct anticipation of the close of the selection, and held myself poised for the *finale*. At intervals I noticed a tendency to move my eyes; a peaceful, pastoral, restful feeling; was lulled by the rhythm.'

Bizet, Pearl Fishers; Concert Band. 'The first thing of which I was conscious was a procession of gaudily dressed soldiers; they were not Americans; the wind was blowing the plumes in their hats; a military band was playing; the soldiers were marching; no movements in

my own legs, but contractions at hips. I saw a man standing in an open carriage bowing to the people, pale face and very red hair; blasé women with him in the carriage; lions walked in the street after the carriage. It occurred to me that this was strange, but I noticed strains in the music which sounded like the roar of lions; my visual picture persisted. Then came priests or choir boys swinging censers in rhythm; I was profoundly impressed by the motor accompaniment again. Then, I seemed to be in a church; the priests marched in slowly, and circled around; the soldiers were dressed in blue; I saw the gleam of yellow light on the censers. After the music had stopped, I was confused by the incongruity of it all. This is my ordinary way of reacting to music. When I am fatigued, it always rests me to hear good music because it carries me so far afield, I see so many unusual spectacles; the music suggested a story, an Arthurian legend. I was very much impressed by the dignity and beauty of the court; it was a peculiar feeling with a tinge of sadness in it. I was in the country; dark clouds were scudding across the moon; a melancholy weird place. The piano at first suggested the rustle of leaves, but this did not suit; then, it suggested an expanse of water; I saw the waves and the light gleaming on them. Just such a mood as would come on such a night was present here; it was pensive, rather than melancholy. The change in time was followed by muscular strains in my arm and hand; I followed the rapid little places on my toes; in the slower parts I had a tendency to hold my muscles in suspense, waiting for the rapid places; the music was not pleasant, because it was fatiguing to remain so long on my toes.⁷

Observer C. This auditor was characterized by a total dearth of auditory imagery; nor was visual imagery ever reported, save in exceedingly rare instances. His dominant imagery was of a motor sort, usually vocal-motor, although there were frequent manual-motor images which had to do with the localization of the pitch relations in a graphic schema in external space. Memories of former situations and former experiences were frequently aroused by familiar selections. His attention was active throughout. This auditor was interested in the compositions as a psychologist, and not as a musician; his was a distinctly introspective attitude, but he insisted that this was his typical attitude in listening to music. Unfamiliar compositions and compositions in which the melody was not prominent usually failed to interest him, and he gave more non-emotional introspections than any other of our auditors; but moods of various sorts and the emotion of pleasantness were usually reported when the selection was familiar. His most prominent reaction was of a motor sort; various parts of his body reacted to rhythm and to melody; and the experiences of expectation and satisfaction were accompanied by muscular tension and relaxation. He is convinced that these muscular reactions play a prominent part in his enjoyment of music.

Hauser, Cradle Song; Cello. 'When the music came, there was a relaxation. I tried to recognize it but could not; I noticed the violin,—vocal-motor image of violin. I anticipated to see whether the note would go up or down,—a tendency to accompany the change in pitch with my body, to ride with it; often, the note does not go where I want it to go. I noticed the piano accompaniment late. There was a constant motor accompaniment,—head and eye-brows, and changes in breathing; I forgot my right arm entirely. I enjoyed the music; it was restful; almost but not quite melancholy.'

Herbert, Badinage; Orchestra. 'Music came rather suddenly; feeling 'I like that.' There was a relaxation; a feeling of disappointment when I discovered the jerkiness of it. Music faded a little and a partly visual image of the orchestra came; I saw more of the leader than usual. The quick little passage was vaguely projected a little above me with a movement something like writing in the air; this was visual-motor. At one place, I thought the music would cease; I was all attention, but it did not stop; there was a pause, a little uncertainty, then music went on again. I felt a settling back as before,—a change in the muscular feel, but this was vague. Feeling 'Why does he break it up so'—awareness of thought: 'It is going to settle down.' A visual image of one end of the orchestra at a theatre; vague verbal image of 'Poli's Theatre.' When at last, the conventional form of the *finale* approached I recognized it clearly.'

Observer S. This observer occasionally reported visual imagery; he seemed to see the conductor of the orchestra or the orchestra itself. Auditory imagery was wholly lacking. His motor imagery was frequent and vivid; and in addition, he tended to beat time and to sway to the music. Memories of former experiences were sometimes aroused by the compositions; but his most frequent memories had to do with similar compositions which were suggested by the present selection. His attention was almost invariably passive; and there never was any attempt to analyze musical compositions. He reported emotions of pleasantness, excitement and repose, but none of these were ever present in intensive degree. In the case of excitement, he was always aware of muscular tenseness. His moods included only those which might be described in such terms as 'quiet' or 'excited.' The chief component of his mental content was almost entirely motor. He was conscious of rhythmic muscular movements throughout. The pitch relationships were projected into external space in a motor-visual schema; his memory of musical compositions always assumes this form.⁷

Sousa, Diplomat March; Concert Band. 'When the music began, I had almost immediately a visual image of a band standing in circular formation. Each musician was swaying to the music, and I seemed to

⁷ It may be added in this connection, that S. possesses an exceedingly definite motor-visual number-form which, he reports, is of distinct service to him in his dealing with numerical relations.

be swaying myself; I had a visual image of the band-master beating time with a baton; I was conscious of the rhythm, and I seemed to be swaying with it; I had no tendency to keep time with hands or feet, but only with my body as a whole; at no time was I aware of the presence of the apparatus or of the phonograph; I was conscious only of the band and of the music; I saw the players take down their instruments at certain stages during the selection, and put them up again before they began to play.'

Toboni, Hungarian Fantasie; Orchestra. 'No imagery except muscular; I seemed to sway up and down in the air; in several places I felt as if I were conducting the orchestra; I felt myself going through the motions; when one instrument came in *solo* and the others came in later, I felt as if I were being dragged, as if I were heavy; I seemed to be responsible for holding the instruments together; I must do my part or the orchestra will break down; I knew when the *finale* was coming; this came in motor terms. When the music suddenly stopped, I seemed to come down with a thud; when it rose to a climax, I rose with it, became more tense, then I dropped.'

A survey of the introspective descriptions of our eight auditors reveals the fact that while they all possess certain characteristics in common, yet they manifest wide individual differences. It is therefore difficult, if not impossible, to classify musical attitudes and musical enjoyment into types, if by types we mean absolute differences in habitual mode of reaction. The individual variations which have been revealed are differences in degree only. For instance, the attitude of every auditor partakes in some degree of the characteristic which is describable as intellectual, in the sense that it is critical and evaluating. That which is evaluated, however, may, in one case, be the art of the performer, and in another case, the art of the composer. The standard of evaluation may vary between exceedingly wide limits,—between the criteria of the naïve and unsophisticated dilettante and the criteria of the educated and refined musician. This critical or evaluating or intellectual attitude is the most conspicuous attribute of the trained and cultured auditor, while it is a wholly subordinate characteristic in the naïve and untrained auditor. While it is possible to regard these two individuals, manifesting such extreme differences of attitudes as they do, as representatives of different types, one finds that the matter of classification is complicated, in practical experience, by the fact that numerous intermediate variants of attitude are interpolated between these two extremes; and the same difficulty will be encountered if we choose any other characteristic in the auditor as our basis of classification.

When we compare the several descriptions, point for point, we find that no essential differences between individuals are revealed in so far as emotive experience and motor reactions

are concerned, and that the greatest differences have to do with imaginal content, behavior of attention, and general attitude toward music. There are individuals in whom visual imagery *per se* constitutes a chief basis of musical enjoyment; and there are individuals in whom visual imagery makes no direct contribution whatever to musical enjoyment. It is true that these two types of individual are also distinguished by differences in attitude and by differences in behavior of attention; the former type of auditor is usually a relatively impassive spectator of a kaleidoscopic scene,—a dance, a drama, or a procession. Not only is this auditor characterized by a passive attention; he is also characterized by a relatively uncritical attitude toward the work both of the performer and of the composer. On the other hand, the individual in whom visual imagery plays no significant part, may derive his enjoyment from either of two sources: from his motor reactions, in which case he represents a mode of procedure which is common to all auditors, but which is here present in exaggerated form; or, from his auditory imagery, which in turn, furnishes him with the means of analyzing the work of the composer and of appreciating the subtler shadings of musical meaning which are lost to the auditor who does not habitually adopt this analytical procedure. It is to be added that characteristic differences of attention are also exemplified in these several types of auditor. The analyst must, in the very nature of the case, concentrate a high degree of attention upon the task he is undertaking if that task is to be successfully accomplished; on the other hand, the auditor who derives his keenest enjoyment from involuntary motor reaction to the music, or from a vivid play of imagery of which he is a mere spectator, may be characterized by the fact that his attention is the very opposite of active. Concomitant with this difference of attitude and with the corresponding difference of attention is a difference of source of enjoyment. In the case of the analyst, enjoyment is essentially due to an intellectual appreciation of the art of the composer (and of the performer); in the case of the non-analytic type of auditor, enjoyment is essentially of sensory origin,—traceable to pleasing timbres and nuances of tone, to pleasurable associations aroused by the composition, to enjoyable motor reactions, to rhythm, to changes in pitch, and the like.

Our introspective descriptions show no qualitative differences between observers in so far as emotive experiences

and motor reactions are concerned. They do, however, show exceedingly great differences in the degree in which these two factors may be present; and these differences are so great as to constitute a difference in type of auditor. Certain auditors assume a coldly critical attitude; their rôle is exclusively that of the observer of a production in which they take no part; these auditors are relatively inactive. Their motor reactions play an insignificant part; and their emotions are usually describable in terms of pleasantness and unpleasantness alone. In the case of the auditor of the other type, the music is an expression of himself; he feels himself into it; he himself moves with it; and his *Einfühlung* and his *Mitbewegung* are of paramount significance throughout. The extreme representative of this type cares little for the analysis of the composition as a work of art. His enjoyment is due, in great measure, to his own imagined or real activity. The dimension of excitement-repose is here added to that of pleasantness-unpleasantness; and moods are usually present in more intensive form. The musician of exceptional temperament and exceptional culture probably represents the analytical attitude in more extreme form than was observed in any of our auditors; and it seems to be equally probable that the average auditor is to be assigned to a position between the two extremes which we have described.

V. CONCLUSIONS

In the foregoing descriptions and citations from the inspections of our observers, we have endeavored to include every important item which seemed to have significance for the appreciation and enjoyment of music. The experiment proved to be a revelation not only to the observers, who continued to develop more and more introspective skill as the experiment progressed and who never ceased to wonder at the invariable presence and apparent functional significance of their kinaesthetic experiences both sensational and imaginal, but also to the writer, who, after several years' experience as a college teacher of music, was guilty of a bias toward a purely auditory enjoyment of music.

The summary and conclusions which follow are therefore, entirely the conclusions to which the facts established in the investigation have impelled us. The conclusions may be summarized under two heads.

A. *Physiological*

1. Listening to music is accompanied by disturbances in the distribution of the blood supply; but there are numerous indications that these circulatory changes may be referred, for the most part, to variations in the function of attention; and that they are not symptoms or products of emotional variations or of any other variations which are characteristic exclusively of music as such.

2. Under the influence of music, the heart-rate tends to increase; whether attention be voluntary or involuntary, active or passive, and whether the tempo of the music be fast or slow.

3. Under the influence of music, the chief characteristic of respiration is irregularity, both as to rate and as to amplitude. This degree of irregularity varies directly with the intensity of the emotion experienced by the observer. The rate of respiration, while irregular, tends to increase over the normal. No constant correlation between respiration and the musical phrasing can be established.

4. The muscular reactions, including not only those movements which are made in unison with the musical rhythms, but also those movements which are found to be invariable or all but invariable attendants of feelings of strain and relaxation, are of great importance in the appreciation of music.

B. *Introspective*

1. The enjoyment of music is a complex experience. The components of this experience are or may be:

a. A pleasurable emotion which is due to the timbres of the instruments and to their nuances of tone.

This component is subject to wide individual variation. There is a distinct affective coloring which inheres in musical sounds as such; certain individuals have an especial fondness for the violin, others for the trombone, etc. Others again do not prefer the clang-tint of any particular instrument but derive an especial enjoyment from certain combinations of timbres, as *e. g.*, the combination of flute and violin, of the various wood-wind instruments, the various stringed instruments or any other *ensemble* effect.

b. A pleasurable reaction on the part of the observer himself to the rhythms of the musical composition.

This again is subject to considerable individual variation; yet it is a fact that every auditor reacts to music with a more or less definite and pronounced motor response. This response may consist in the more patent and obvious movement of beating time; and it may run the gamut through the various gradations from this crude reaction to the subtlest play of sheer images of non-executed movements. Between these two extremes are found individuals who, while the music is

being played, accompany it by singing or whistling; and individuals who evince no outward signs of such a motor response but yet who follow the melody with vivid and intense vocal-motor or manual-motor images,—with at least an occasional participation of motor innervations of slight degree.

c. Pleasurable associations which are the product, in the main, of past experiences,—associations which have now become more or less familiar to the auditor.

This component is particularly prominent during the rendition of familiar compositions. In such cases, even though the identity between the remembered and the recognized melody be only partial and approximate, the present composition tends to revive the original experience during which it was heard before, together with a wealth and variety of imaginal and emotional accompaniments.

d. Pleasure derived from the observer's play of imagery,—the latter being itself a product of the musical stimuli.

Here are included the hosts of mental images from every modality of sense, which in many instances weave themselves into a story or drama whose unfolding is a source of intense enjoyment to the combined auditor and spectator; in other instances, particularly where the auditory imagery predominates in the complex, the subject tends to predict what the composer will give him next. A successful prediction is invariably attended by a glow and suffusion of emotional warmth, due chiefly to the fact that the observer feels that he is master of the situation. Those auditors who are also trained vocalists or skilled performers upon any instrument derive intense pleasure from the act of projecting themselves into the chorus or into the orchestra, and imagining themselves as participants in the production.

e. A pleasurable mood which is usually characterized by its persistence, although it may change with changes in the character of the composition.

This mood may be due, in part, to the peculiar temperament of the individual, or, in part, to the temporary emotion which may dominate him at the instant when the musical rendition begins. Yet it is true that the composition itself may arouse a mood of its own making, and for that reason may itself be described as triumphant, yearning, confident, imploring, mournful, elating, depressive, filled with hope, with abandon, with mystery, with tenderness.

f. In addition to these more specifically emotional components, there is present also an intellectual activity which can best be described as an analysis of melodic and harmonic structure, and an appreciation of the skill or dexterity of the performance itself. Both of these more purely intellectual functions contribute to an enjoyment of the composition and of the execution of the musical selection.

2. These various components are far from being of equal value and of equal significance in the appreciation and enjoy-

ment of music. While it is not possible, in the present status of our knowledge of the topic, to seriate these several components in a systematically arranged hierarchy, still it may be said that, at least so far as our observers are concerned, visual imagery makes the least important contribution; and the contributions which flow from the observers' motor reactions constitute the most essential factor for all auditors except those whose attitude is of the purely intellectual sort.

3. Just as in the average normal auditor, emotional enjoyment is a product chiefly of motor imagery and motor reaction, so his intellectual appreciation is a function almost exclusively of auditory imagery and of intellectual processes based thereon.

4. Music is powerless to portray a definite picture in any uniform or universal sense, or to convey the same group of imagery into the minds of each of its auditors.

5. An introspective analysis of the experience of listening to music indicates the existence of a variety of types of auditor. Ideally, these types may be conceived as being, at bottom, qualitatively different; but, in practice, they may exist in such intimate combination with one another that one finds it difficult, in many instances, to discover well-marked lines of demarcation between them. The more prominent typical differences which were found to exist in our eight observers are as follows:

a. *The Analytic Type*: To this type belong those whose ordinary procedure consists in subjecting the musical composition and also the performance of the music to a critical analysis. A high degree of attention is normally employed; and auditory and motor imagery are prominent in greater or less degree.

b. *The Motor Type*: To this type belong those observers, in whom the motor reaction to music is dominant. This motor reaction may take one of two forms—singing or whistling; and movements, actual or imaginal, of other voluntary muscles. In these individuals attention may be less active; and auditory imagery may be entirely absent.

c. *The Imaginative Type*: To this type belong all those observers for whom music constitutes a stimulus to the imagination. Their imagery may be from any or from all sense-departments. Attention may be of various degrees; but it ordinarily tends to passivity. With the lowest degree of attention, day dreams, reveries, etc., or even, in some cases, thought processes concerning matters entirely foreign to the

music, may occupy the focus of consciousness, while the music remains in the fringe.

These types, however, are not fixed and permanent. At any time, an observer may shift from one type to another by a change in the degree of attention. For example, Fn. customarily belongs to the analytic type; if, however, he finds a composition uninteresting his reaction ceases to be analytic and becomes imaginative. This shift and variation of typical procedure is common to most observers.

d. Emotional Types. It is also possible to differentiate various types of auditor from the point of view of emotive content. For instance, the extreme representative of the intellectual or analytical type of procedure is coldly critical. Not only does it seem probable that the emotional experiences and the emotional reactions of this type of auditor never reach an exceedingly high degree of intensity, but it is also probable that his emotions are always describable in terms of pleasantness-unpleasantness. Moreover, the pleasantness-unpleasantness itself is always found to be chiefly of an intellectual sort. The opposite extreme would be represented by an individual who is wholly unaware of the meaning and of the excellence of the musical composition as a work of art. The 'musical consciousness' of such an hypothetical individual would consist exclusively of motor reactions, imaginal or real, together with a play of imagery; and it would be essentially characteristic of this individual that his attention would be absolutely passive and involuntary throughout. His emotive consciousness would consist of both moods and emotions,—the former of which are characteristically lacking in the extreme representative of the intellectual type. Moreover, the emotions of the reflex or sensory or purely naïve are distinguished by the fact that they are of a sensory sort exclusively, and by the additional fact, that they run the gamut of excitement-repose as well as of pleasantness-unpleasantness. These two extremes of type are seldom if ever encountered in practical experience. The closest approximation to the intellectual extreme is undoubtedly to be found in those composers and professional musicians who exalt the intellectual and decry the emotional in music. The opposite extreme of procedure is to be found in the purely reflex reactions of those volatile individuals who are popularly described as belonging to the emotional type. Between these two extremes of emotional procedure is to be found a place to which may be assigned any given normal auditor; and when this seriation is com-

pleted, it will be found that individuals belonging to different points upon the scale differ from one another in the following characteristics: dominance of mood; composition and content of emotion (*i.e.*, presence or absence of *Einfühlung*, presence or absence of sensory or intellectual emotions); relative profusion and significance of imagery; relative intensity of motor reaction, real or imaginal.

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